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**Etzioni et al.**

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(45) **Date of Patent:** **Sep. 26, 2017**

(54) **ISOLATED POLYNUCLEOTIDES AND POLYPEPTIDES, CONSTRUCT AND PLANTS COMPRISING SAME AND METHODS OF USING SAME FOR INCREASING NITROGEN USE EFFICIENCY OF PLANTS**

(71) Applicant: **Evogene Ltd.**, Rechovot (IL)

(72) Inventors: **Adi Etzioni**, Kibbutz Tzora (IL); **Hagai Karchi**, Moshav Sitriya (IL)

(73) Assignee: **Evogene Ltd.**, Rehovot (IL)

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§ 371 (c)(1),

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#### **Related U.S. Application Data**

(60) Provisional application No. 61/827,801, filed on May 28, 2013, provisional application No. 61/745,877, filed on Dec. 26, 2012.

(51) **Int. Cl.**

**C12N 15/82** (2006.01)

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(52) **U.S. Cl.**

CPC ..... **C12N 15/8271** (2013.01); **C07K 14/415** (2013.01); **C12N 15/8247** (2013.01); **C12N 15/8261** (2013.01); **C12N 15/8273** (2013.01)

(58) **Field of Classification Search**

None

See application file for complete search history.

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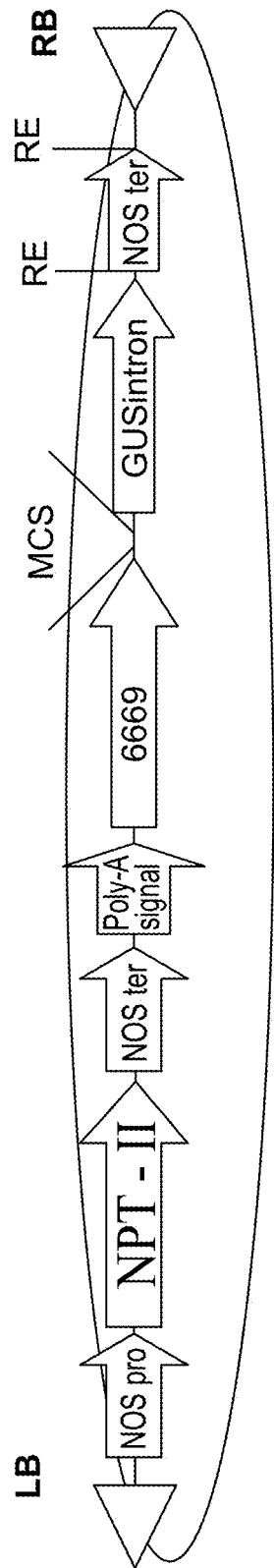
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(57) **ABSTRACT**

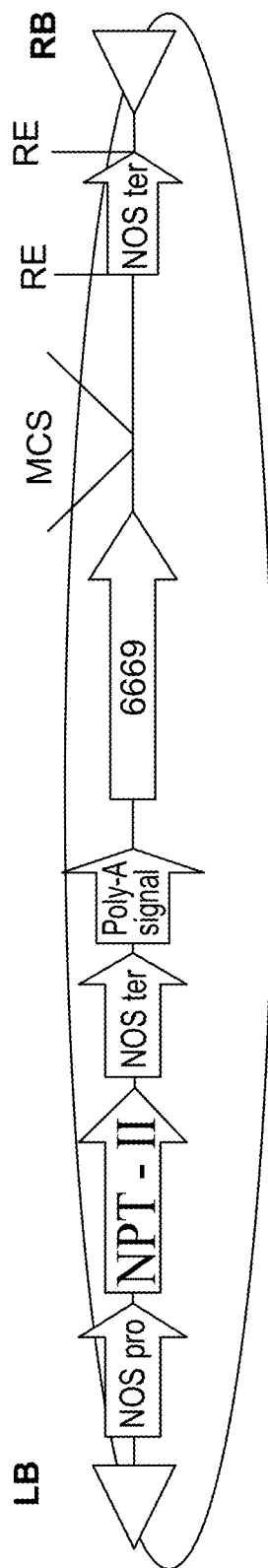
Provided are isolated polypeptides which are at least 80% homologous to SEQ ID NOs: 496-794, 2898-3645, and 3647-4855, isolated polynucleotides which are at least 80% identical to SEQ ID NOs: 1-495 and 795-2897, nucleic acid constructs comprising same, transgenic cells expressing same, transgenic plants expressing same and method of using same for increasing fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, photosynthetic capacity, seed yield, fiber yield, fiber quality, fiber length, and/or abiotic stress tolerance of a plant.

**23 Claims, 10 Drawing Sheets**



pQYN\_6669

FIG. 1



pQFN, pQFNC

FIG. 2

Normal conditions

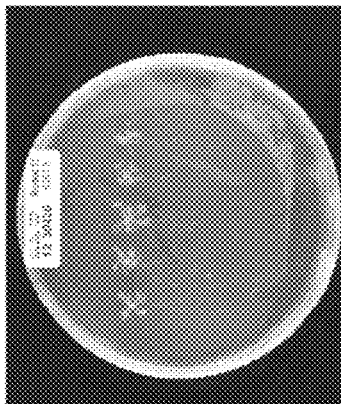


FIG. 3A

Osmotic stress  
(15 % PEG)

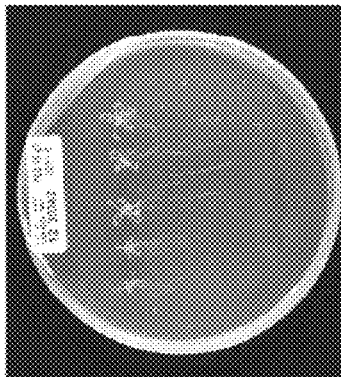


FIG. 3C

Nitrogen limiting  
conditions

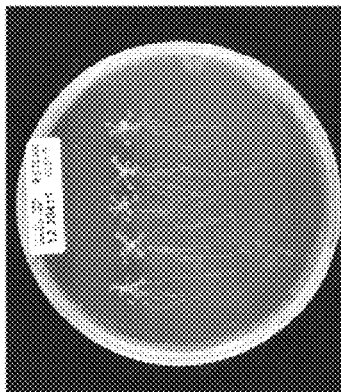


FIG. 3E

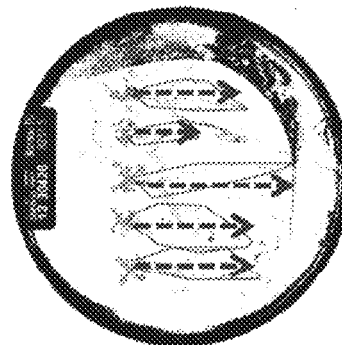


FIG. 3B

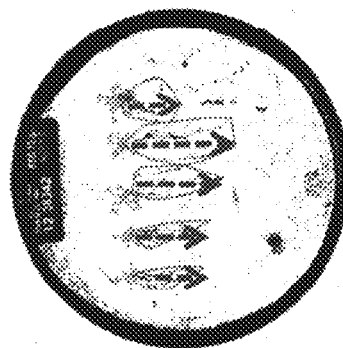


FIG. 3D

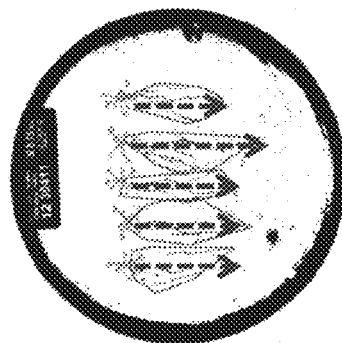
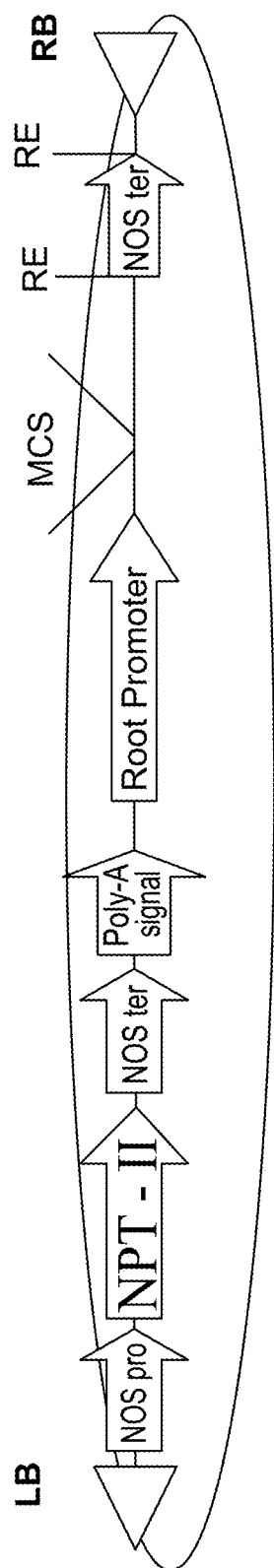
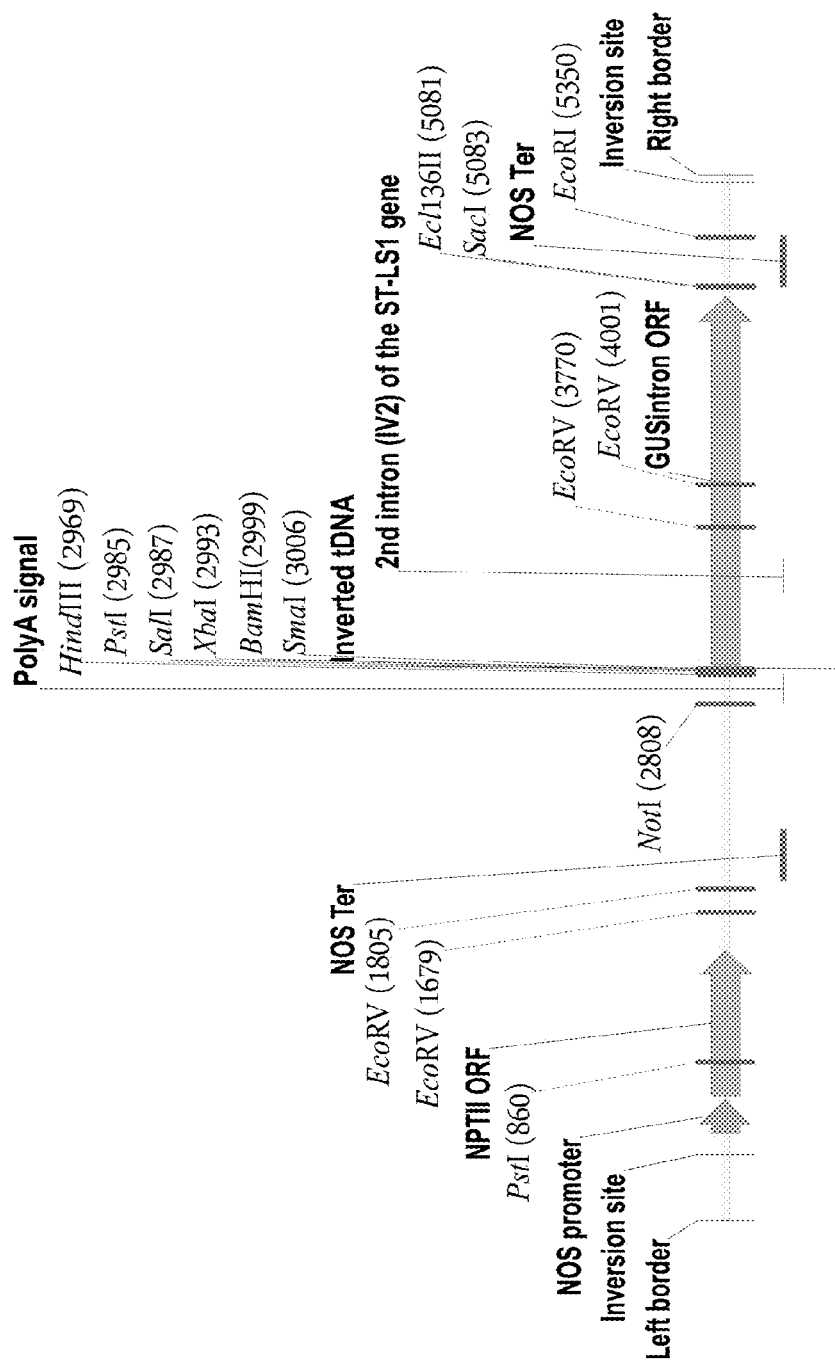


FIG. 3F



pQNa\_RP

FIG. 4



pQYN tDNA rev comp  
5714 bp

FIG. 5

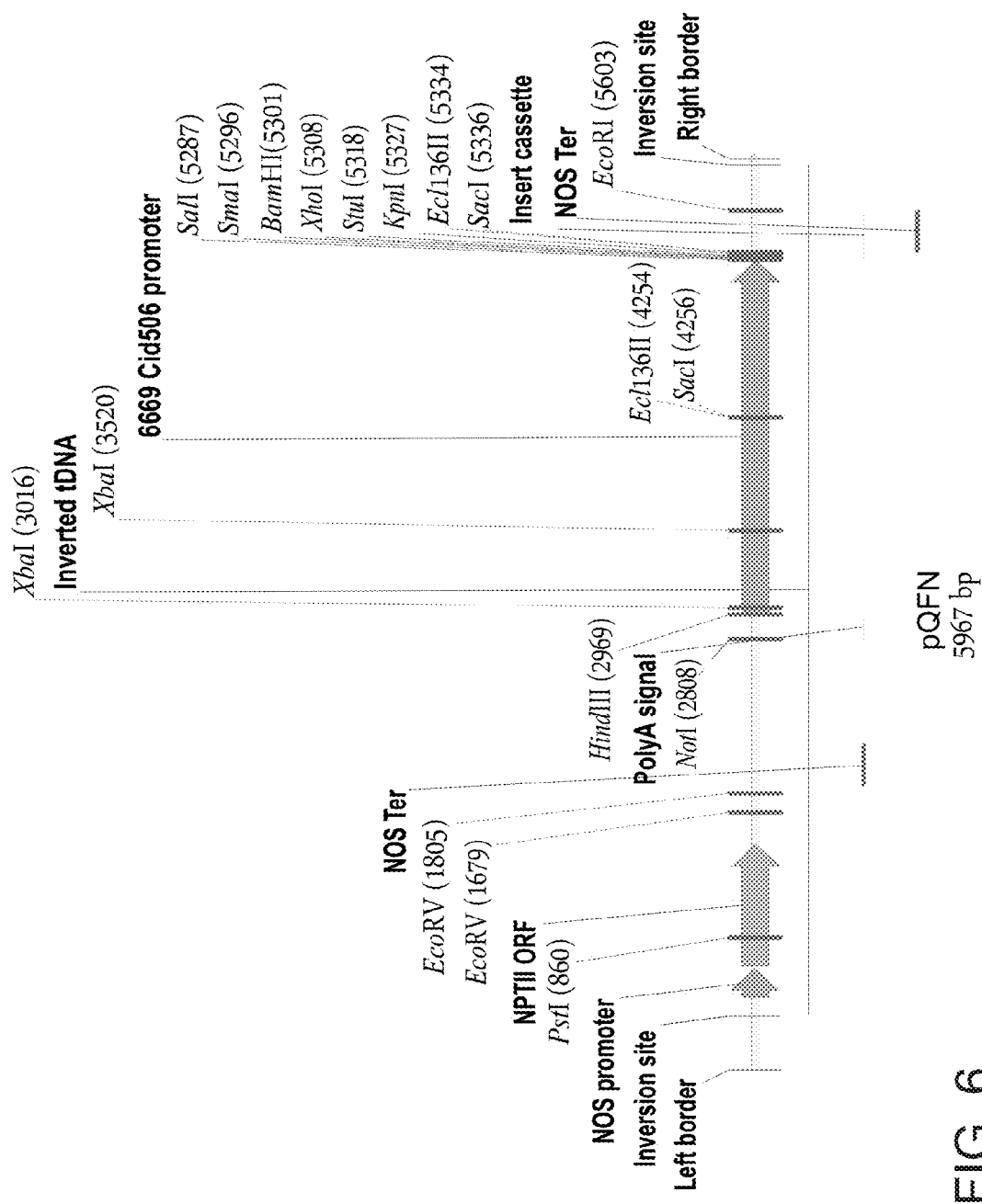
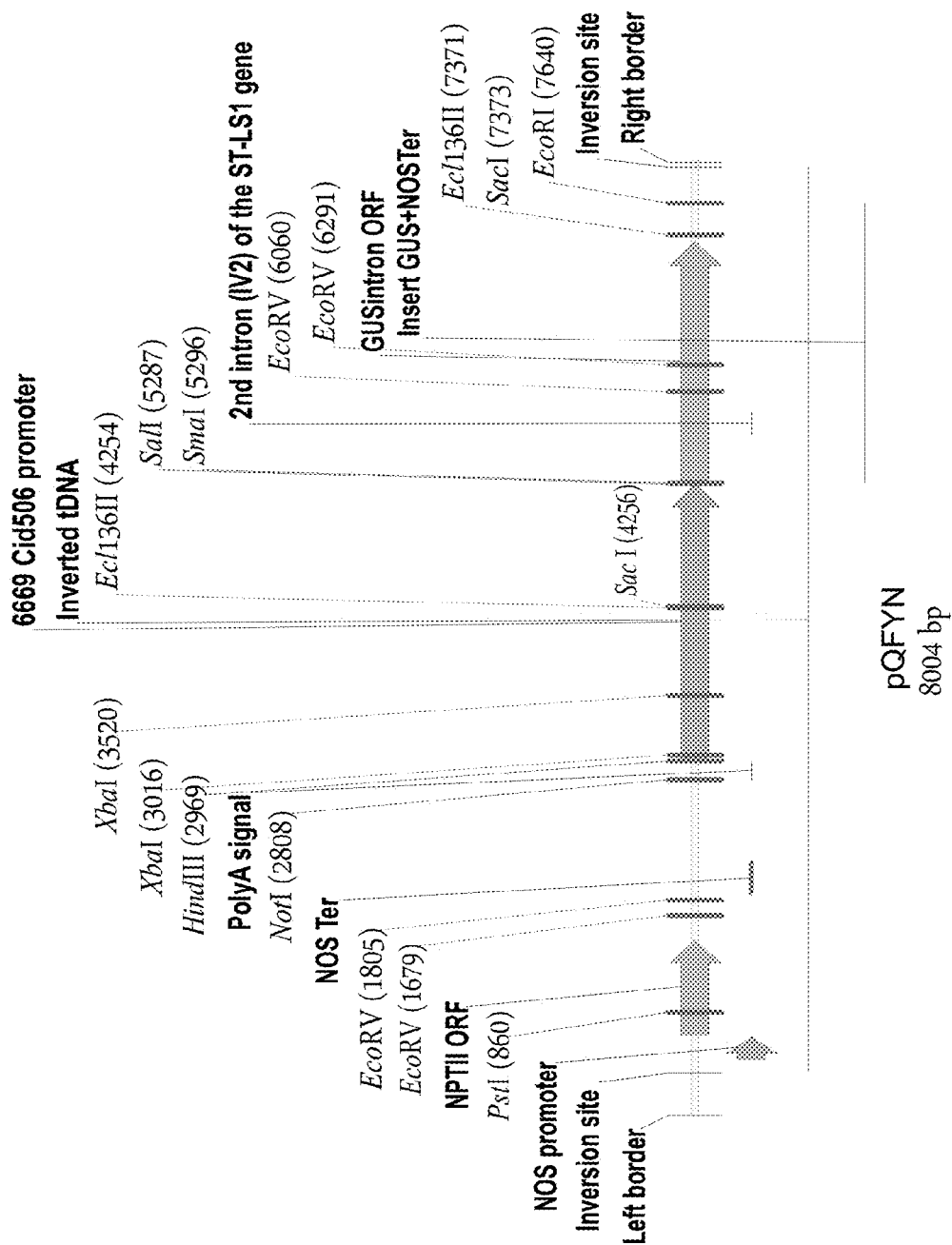
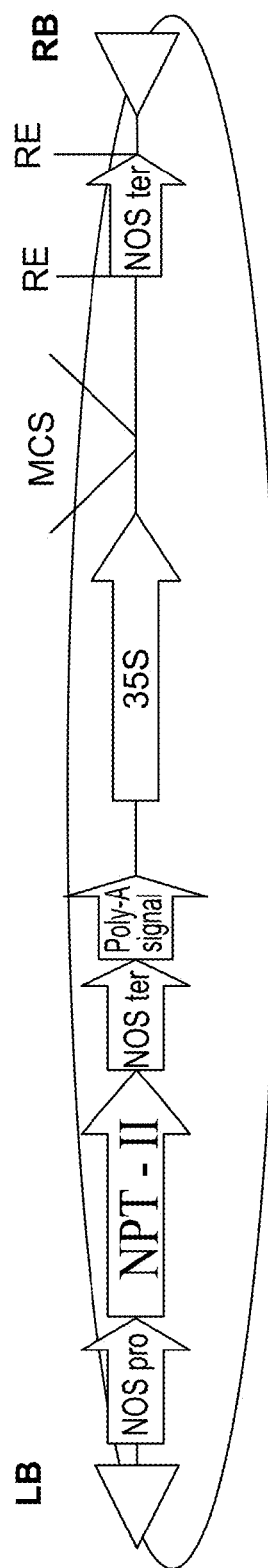


FIG. 6





pQXNc

FIG. 8

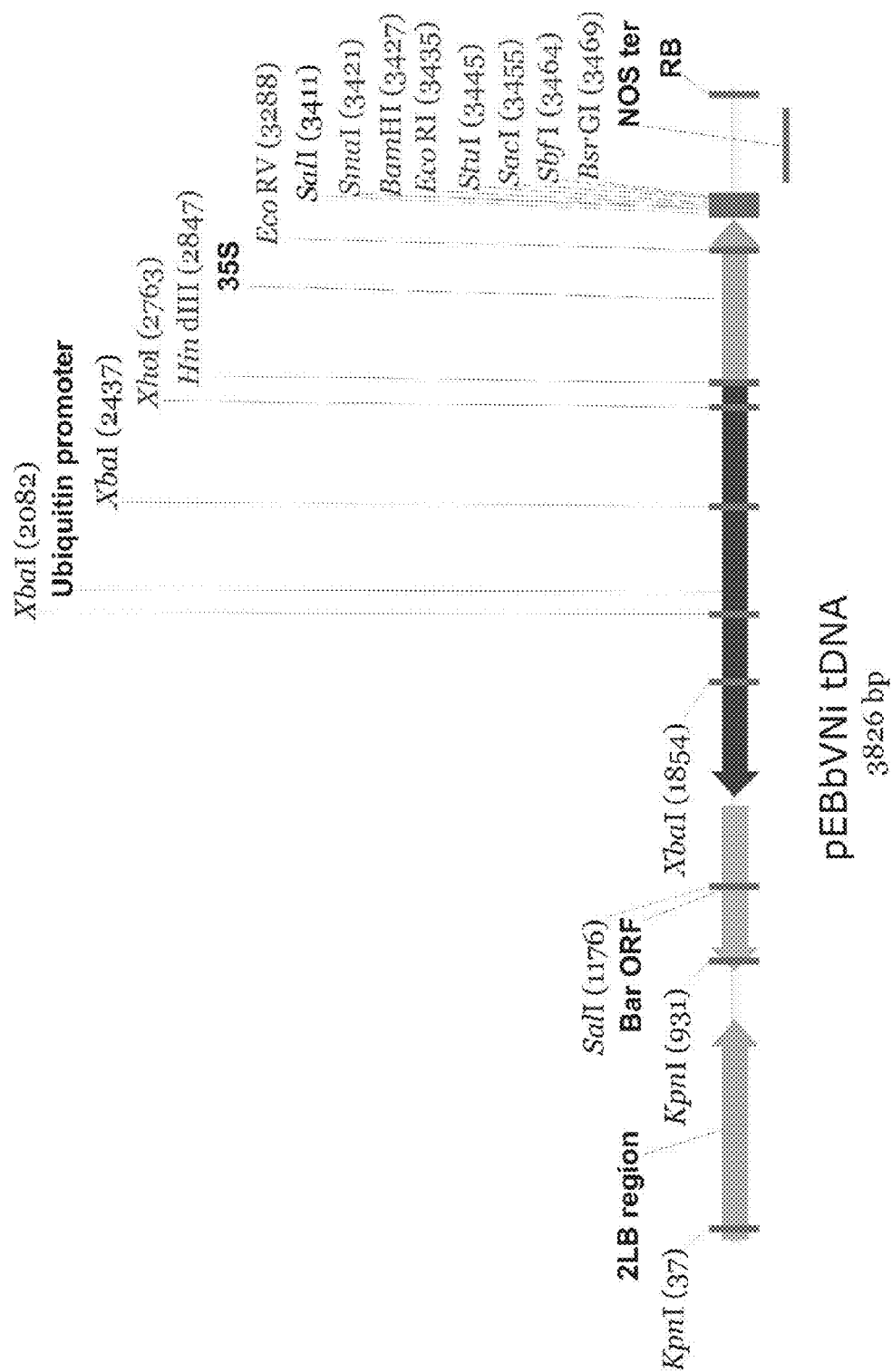


FIG. 9A

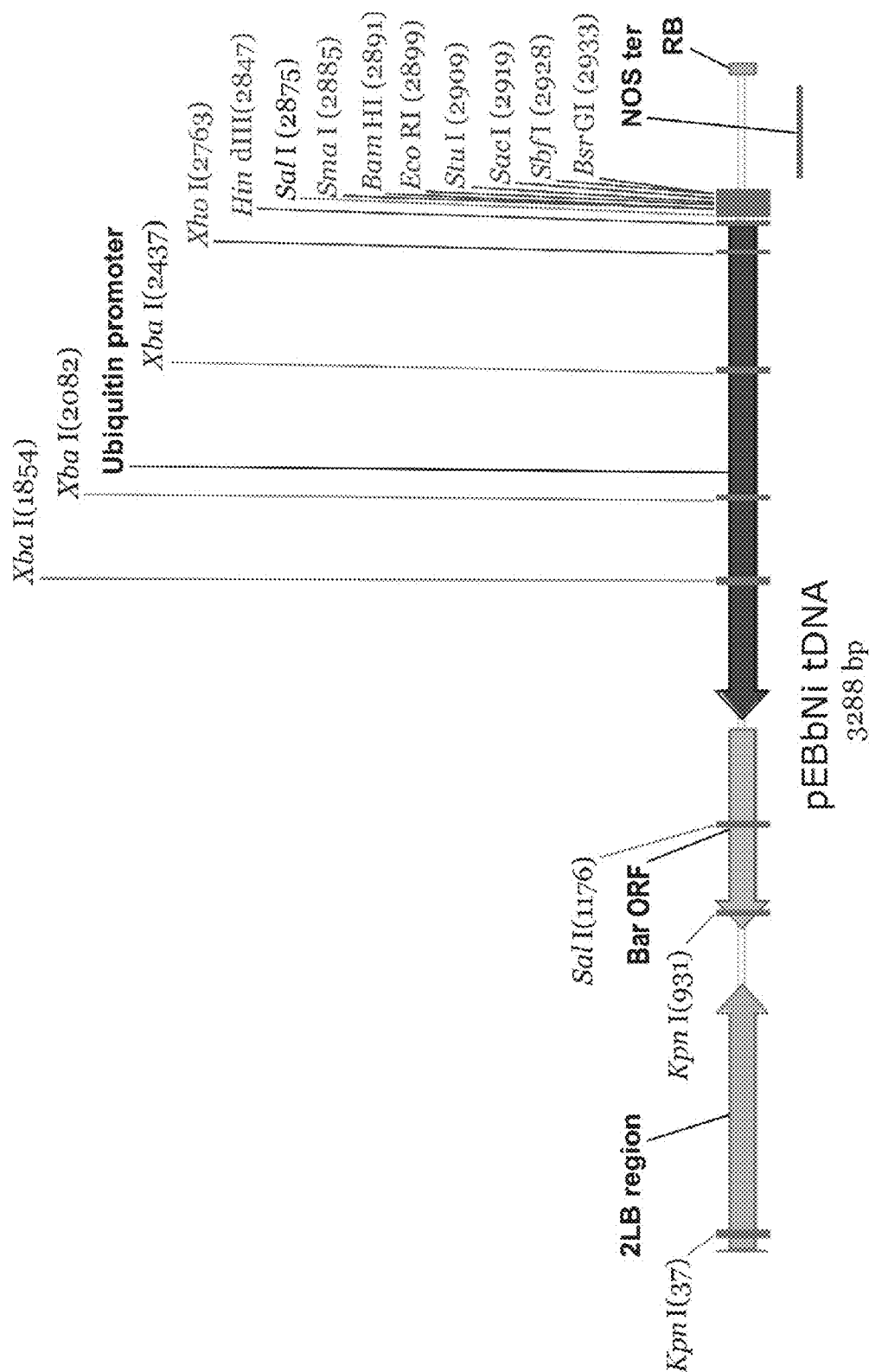


FIG. 9B

**ISOLATED POLYNUCLEOTIDES AND  
POLYPEPTIDES, CONSTRUCT AND PLANTS  
COMPRISING SAME AND METHODS OF  
USING SAME FOR INCREASING NITROGEN  
USE EFFICIENCY OF PLANTS**

**RELATED APPLICATIONS**

This application is a National Phase of PCT Patent Application No. PCT/IL2013/051043 having International filing date of Dec. 19, 2013, which claims the benefit of priority under 35 USC §119(e) of U.S. Provisional Patent Application Nos. 61/827,801 filed on May 28, 2013 and 61/745,877 filed on Dec. 26, 2012. The contents of the above applications are all incorporated by reference as if fully set forth herein in their entirety.

**SEQUENCE LISTING STATEMENT**

The ASCII file, entitled 62550SequenceListing.txt, created on 24 Jun., 2015 comprising 14,819,951 bytes, submitted concurrently with the filing of this application is incorporated herein by reference.

**FIELD AND BACKGROUND OF THE  
INVENTION**

The present invention, in some embodiments thereof, relates to isolated polypeptides and polynucleotides, nucleic acid constructs comprising same, transgenic cells comprising same, transgenic plants exogenously expressing same and more particularly, but not exclusively, to methods of using same for increasing fertilizer use efficiency (e.g., nitrogen use efficiency), yield (e.g., seed yield, oil yield), biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant.

A common approach to promote plant growth has been, and continues to be, the use of natural as well as synthetic nutrients (fertilizers). Thus, fertilizers are the fuel behind the “green revolution”, directly responsible for the exceptional increase in crop yields during the last 40 years, and are considered the number one overhead expense in agriculture. For example, inorganic nitrogenous fertilizers such as ammonium nitrate, potassium nitrate, or urea, typically accounts for 40% of the costs associated with crops such as corn and wheat. Of the three macronutrients provided as main fertilizers [Nitrogen (N), Phosphate (P) and Potassium (K)], nitrogen is often the rate-limiting element in plant growth and all field crops have a fundamental dependence on inorganic nitrogenous fertilizer. Nitrogen is responsible for biosynthesis of amino and nucleic acids, prosthetic groups, plant hormones, plant chemical defenses, etc. and usually needs to be replenished every year, particularly for cereals, which comprise more than half of the cultivated areas worldwide. Thus, nitrogen is translocated to the shoot, where it is stored in the leaves and stalk during the rapid step of plant development and up until flowering. In corn for example, plants accumulate the bulk of their organic nitrogen during the period of grain germination, and until flowering. Once fertilization of the plant has occurred, grains begin to form and become the main sink of plant nitrogen. The stored nitrogen can be then redistributed from the leaves and stalk that served as storage compartments until grain formation.

Since fertilizer is rapidly depleted from most soil types, it must be supplied to growing crops two or three times during

the growing season. In addition, the low nitrogen use efficiency (NUE) of the main crops (e.g., in the range of only 30-70%) negatively affects the input expenses for the farmer, due to the excess fertilizer applied. Moreover, the over and inefficient use of fertilizers are major factors responsible for environmental problems such as eutrophication of groundwater, lakes, rivers and seas, nitrate pollution in drinking water which can cause methemoglobinemia, phosphate pollution, atmospheric pollution and the like. However, in spite of the negative impact of fertilizers on the environment, and the limits on fertilizer use, which have been legislated in several countries, the use of fertilizers is expected to increase in order to support food and fiber production for rapid population growth on limited land resources. For example, it has been estimated that by 2050, more than 150 million tons of nitrogenous fertilizer will be used worldwide annually.

Increased use efficiency of nitrogen by plants should enable crops to be cultivated with lower fertilizer input, or alternatively to be cultivated on soils of poorer quality and would therefore have significant economic impact in both developed and developing agricultural systems.

Genetic improvement of fertilizer use efficiency (FUE) in plants can be generated either via traditional breeding or via genetic engineering.

Attempts to generate plants with increased FUE have been described in U.S. Pat. Appl. Publication No. 20020046419 (U.S. Pat. No. 7,262,055 to Choo, et al.); U.S. Pat. Appl. No. 20050108791 to Edgerton et al.; U.S. Pat. Appl. No. 20060179511 to Chomet et al.; Good, A, et al. 2007 (Engineering nitrogen use efficiency with alanine aminotransferase. Canadian Journal of Botany 85: 252-262); and Good A G et al. 2004 (Trends Plant Sci. 9:597-605).

Yanagisawa et al. (Proc. Natl. Acad. Sci. U.S.A. 2004 101:7833-8) describe Dof1 transgenic plants which exhibit improved growth under low-nitrogen conditions.

U.S. Pat. No. 6,084,153 to Good et al. discloses the use of a stress responsive promoter to control the expression of Alanine Amine Transferase (AlaAT) and transgenic canola plants with improved drought and nitrogen deficiency tolerance when compared to control plants.

Yield is affected by various factors, such as, the number and size of the plant organs, plant architecture (for example, the number of branches), grains set length, number of filled grains, vigor (e.g. seedling), growth rate, root development, utilization of water, nutrients (e.g., nitrogen) and fertilizers, and stress tolerance.

Crops such as, corn, rice, wheat, canola and soybean account for over half of total human caloric intake, whether through direct consumption of the seeds themselves or through consumption of meat products raised on processed seeds or forage. Seeds are also a source of sugars, proteins and oils and metabolites used in industrial processes. The ability to increase plant yield, whether through increase dry matter accumulation rate, modifying cellulose or lignin composition, increase stalk strength, enlarge meristem size, change of plant branching pattern, erectness of leaves, increase in fertilization efficiency, enhanced seed dry matter accumulation rate, modification of seed development, enhanced seed filling or by increasing the content of oil, starch or protein in the seeds would have many applications in agricultural and non-agricultural uses such as in the biotechnological production of pharmaceuticals, antibodies or vaccines.

Vegetable or seed oils are the major source of energy and nutrition in human and animal diet. They are also used for the production of industrial products, such as paints, inks

and lubricants. In addition, plant oils represent renewable sources of long-chain hydrocarbons which can be used as fuel. Since the currently used fossil fuels are finite resources and are gradually being depleted, fast growing biomass crops may be used as alternative fuels or for energy feedstocks and may reduce the dependence on fossil energy supplies. However, the major bottleneck for increasing consumption of plant oils as bio-fuel is the oil price, which is still higher than fossil fuel. In addition, the production rate of plant oil is limited by the availability of agricultural land and water. Thus, increasing plant oil yields from the same growing area can effectively overcome the shortage in production space and can decrease vegetable oil prices at the same time.

Studies aiming at increasing plant oil yields focus on the identification of genes involved in oil metabolism as well as in genes capable of increasing plant and seed yields in transgenic plants. Genes known to be involved in increasing plant oil yields include those participating in fatty acid synthesis or sequestering such as desaturase [e.g., DELTA6, DELTA12 or acyl-ACP (Ssi2; *Arabidopsis* Information Resource (TAIR; *arabidopsis* (dot) org/), TAIR No. AT2G43710)], OleosinA (TAIR No. AT3G01570) or FAD3 (TAIR No. AT2G29980), and various transcription factors and activators such as Led 1 [TAIR No. AT1G21970, Lotan et al. 1998. Cell. 26; 93(7):1195-205], Lec2 [TAIR No. AT1G28300, Santos Mendoza et al. 2005, FEBS Lett. 579 (21):4666-70], Fus3 (TAIR No. AT3G26790), ABI3 [TAIR No. AT3G24650, Lara et al. 2003. J Biol Chem. 278(23): 21003-11] and Wri1 [TAIR No. AT3G54320, Cernac and Benning, 2004. Plant J. 40(4): 575-85].

Genetic engineering efforts aiming at increasing oil content in plants (e.g., in seeds) include upregulating endoplasmic reticulum (FAD3) and plastidal (FAD7) fatty acid desaturases in potato (Zabrouskov V., et al., 2002; Physiologia Plant. 116:172-185); over-expressing the GmDof4 and GmDof11 transcription factors (Wang H W et al., 2007; Plant J. 52:716-29); over-expressing a yeast glycerol-3-phosphate dehydrogenase under the control of a seed-specific promoter (Vigeolas H, et al. 2007, Plant Biotechnol J. 5:431-41; U.S. Pat. Appl. No. 20060168684); using *Arabidopsis* FAE1 and yeast SLC1-1 genes for improvements in erucic acid and oil content in rapeseed (Katavic V, et al., 2000, Biochem Soc Trans. 28:935-7).

Various patent applications disclose genes and proteins which can increase oil content in plants. These include for example, U.S. Pat. Appl. No. 20080076179 (lipid metabolism protein); U.S. Pat. Appl. No. 20060206961 (the Ypr140w polypeptide); U.S. Pat. Appl. No. 20060174373 [triacylglycerols synthesis enhancing protein (TEP)]; U.S. Pat. Appl. Nos. 20070169219, 20070006345, 20070006346 and 20060195943 (disclose transgenic plants with improved nitrogen use efficiency which can be used for the conversion into fuel or chemical feedstocks); WO2008/122980 (polynucleotides for increasing oil content, growth rate, biomass, yield and/or vigor of a plant).

Abiotic stress (ABS; also referred to as "environmental stress") conditions such as salinity, drought, flood, suboptimal temperature and toxic chemical pollution, cause substantial damage to agricultural plants. Most plants have evolved strategies to protect themselves against these conditions. However, if the severity and duration of the stress conditions are too great, the effects on plant development, growth and yield of most crop plants are profound. Furthermore, most of the crop plants are highly susceptible to abiotic stress and thus necessitate optimal growth conditions for commercial crop yields. Continuous exposure to stress

causes major alterations in the plant metabolism which ultimately leads to cell death and consequently yield losses.

Drought is a gradual phenomenon, which involves periods of abnormally dry weather that persists long enough to produce serious hydrologic imbalances such as crop damage, water supply shortage and increased susceptibility to various diseases. In severe cases, drought can last many years and results in devastating effects on agriculture and water supplies. Furthermore, drought is associated with increase susceptibility to various diseases.

For most crop plants, the land regions of the world are too arid. In addition, overuse of available water results in increased loss of agriculturally-usable land (desertification), and increase of salt accumulation in soils adds to the loss of available water in soils.

Salinity, high salt levels, affects one in five hectares of irrigated land. None of the top five food crops, i.e., wheat, corn, rice, potatoes, and soybean, can tolerate excessive salt. Detrimental effects of salt on plants result from both water deficit, which leads to osmotic stress (similar to drought stress), and the effect of excess sodium ions on critical biochemical processes. As with freezing and drought, high salt causes water deficit; and the presence of high salt makes it difficult for plant roots to extract water from their environment. Soil salinity is thus one of the more important variables that determine whether a plant may thrive. In many parts of the world, sizable land areas are uncultivable due to naturally high soil salinity. Thus, salination of soils that are used for agricultural production is a significant and increasing problem in regions that rely heavily on agriculture, and is worsened by over-utilization, over-fertilization and water shortage, typically caused by climatic change and the demands of increasing population. Salt tolerance is of particular importance early in a plant's lifecycle, since evaporation from the soil surface causes upward water movement, and salt accumulates in the upper soil layer where the seeds are placed. On the other hand, germination normally takes place at a salt concentration which is higher than the mean salt level in the whole soil profile.

Salt and drought stress signal transduction consist of ionic and osmotic homeostasis signaling pathways. The ionic aspect of salt stress is signaled via the SOS pathway where a calcium-responsive SOS3-SOS2 protein kinase complex controls the expression and activity of ion transporters such as SOS1. The osmotic component of salt stress involves complex plant reactions that overlap with drought and/or cold stress responses.

Suboptimal temperatures affect plant growth and development through the whole plant life cycle. Thus, low temperatures reduce germination rate and high temperatures result in leaf necrosis. In addition, mature plants that are exposed to excess of heat may experience heat shock, which may arise in various organs, including leaves and particularly fruit, when transpiration is insufficient to overcome heat stress. Heat also damages cellular structures, including organelles and cytoskeleton, and impairs membrane function. Heat shock may produce a decrease in overall protein synthesis, accompanied by expression of heat shock proteins, e.g., chaperones, which are involved in refolding proteins denatured by heat. High-temperature damage to pollen almost always occurs in conjunction with drought stress, and rarely occurs under well-watered conditions. Combined stress can alter plant metabolism in novel ways. Excessive chilling conditions, e.g., low, but above freezing, temperatures affect crops of tropical origins, such as soybean, rice, maize, and cotton. Typical chilling damage includes wilting, necrosis, chlorosis or leakage of ions from

cell membranes. The underlying mechanisms of chilling sensitivity are not completely understood yet, but probably involve the level of membrane saturation and other physiological deficiencies. Excessive light conditions, which occur under clear atmospheric conditions subsequent to cold late summer/autumn nights, can lead to photoinhibition of photosynthesis (disruption of photosynthesis). In addition, chilling may lead to yield losses and lower product quality through the delayed ripening of maize.

Common aspects of drought, cold and salt stress response [Reviewed in Xiong and Zhu (2002) *Plant Cell Environ.* 25: 131-139] include: (a) transient changes in the cytoplasmic calcium levels early in the signaling event; (b) signal transduction via mitogen-activated and/or calcium dependent protein kinases (CDPKs) and protein phosphatases; (c) increases in abscisic acid levels in response to stress triggering a subset of responses; (d) inositol phosphates as signal molecules (at least for a subset of the stress responsive transcriptional changes); (e) activation of phospholipases which in turn generates a diverse array of second messenger molecules, some of which might regulate the activity of stress responsive kinases; (f) induction of late embryogenesis abundant (LEA) type genes including the CRT/DRE responsive COR/RD genes; (g) increased levels of antioxidants and compatible osmolytes such as proline and soluble sugars; and (h) accumulation of reactive oxygen species such as superoxide, hydrogen peroxide, and hydroxyl radicals. Absciscic acid biosynthesis is regulated by osmotic stress at multiple steps. Both ABA-dependent and -independent osmotic stress signaling first modify constitutively expressed transcription factors, leading to the expression of early response transcriptional activators, which then activate downstream stress tolerance effector genes.

Several genes which increase tolerance to cold or salt stress can also improve drought stress protection, these include for example, the transcription factor AtCBF/DREB1, OsCDPK7 (Saijo et al. 2000, *Plant J.* 23: 319-327) or AVP1 (a vacuolar pyrophosphatase-proton pump, Gaxiola et al. 2001, *Proc. Natl. Acad. Sci. USA* 98: 11444-11449).

Studies have shown that plant adaptations to adverse environmental conditions are complex genetic traits with polygenic nature. Conventional means for crop and horticultural improvements utilize selective breeding techniques to identify plants having desirable characteristics. However, selective breeding is tedious, time consuming and has an unpredictable outcome. Furthermore, limited germplasm resources for yield improvement and incompatibility in crosses between distantly related plant species represent significant problems encountered in conventional breeding. Advances in genetic engineering have allowed mankind to modify the germplasm of plants by expression of genes-of-interest in plants. Such a technology has the capacity to generate crops or plants with improved economic, agronomic or horticultural traits.

Genetic engineering efforts, aimed at conferring abiotic stress tolerance to transgenic crops, have been described in various publications [Apse and Blumwald (*Curr Opin Biotechnol.* 13:146-150, 2002), Quesada et al. (*Plant Physiol.* 130:951-963, 2002), Holmström et al. (*Nature* 379: 683-684, 1996), Xu et al. (*Plant Physiol* 110: 249-257, 1996), Pilon-Smits and Ebskamp (*Plant Physiol* 107: 125-130, 1995) and Tarczynski et al. (*Science* 259: 508-510, 1993)].

Various patents and patent applications disclose genes and proteins which can be used for increasing tolerance of plants to abiotic stresses. These include for example, U.S. Pat. Nos. 5,296,462 and 5,356,816 (for increasing tolerance to cold stress); U.S. Pat. No. 6,670,528 (for increasing ABST); U.S.

Pat. No. 6,720,477 (for increasing ABST); U.S. application Ser. Nos. 09/938,842 and 10/342,224 (for increasing ABST); U.S. application Ser. No. 10/231,035 (for increasing ABST); WO2004/104162 (for increasing ABST and biomass); WO2007/020638 (for increasing ABST, biomass, vigor and/or yield); WO2007/049275 (for increasing ABST, biomass, vigor and/or yield); WO2010/076756 (for increasing ABST, biomass and/or yield); WO2009/083958 (for increasing water use efficiency, fertilizer use efficiency, biotic/abiotic stress tolerance, yield and/or biomass); WO2010/020941 (for increasing nitrogen use efficiency, abiotic stress tolerance, yield and/or biomass); WO2009/141824 (for increasing plant utility); WO2010/049897 (for increasing plant yield).

Nutrient deficiencies cause adaptations of the root architecture, particularly notably for example is the root proliferation within nutrient rich patches to increase nutrient uptake. Nutrient deficiencies cause also the activation of plant metabolic pathways which maximize the absorption, assimilation and distribution processes such as by activating architectural changes. Engineering the expression of the triggered genes may cause the plant to exhibit the architectural changes and enhanced metabolism also under other conditions.

In addition, it is widely known that the plants usually respond to water deficiency by creating a deeper root system that allows access to moisture located in deeper soil layers. Triggering this effect will allow the plants to access nutrients and water located in deeper soil horizons particularly those readily dissolved in water like nitrates.

Cotton and cotton by-products provide raw materials that are used to produce a wealth of consumer-based products in addition to textiles including cotton foodstuffs, livestock feed, fertilizer and paper. The production, marketing, consumption and trade of cotton-based products generate an excess of \$100 billion annually in the U.S. alone, making cotton the number one value-added crop.

Even though 90% of cotton's value as a crop resides in the fiber (lint), yield and fiber quality has declined due to general erosion in genetic diversity of cotton varieties, and an increased vulnerability of the crop to environmental conditions.

There are many varieties of cotton plant, from which cotton fibers with a range of characteristics can be obtained and used for various applications. Cotton fibers may be characterized according to a variety of properties, some of which are considered highly desirable within the textile industry for the production of increasingly high quality products and optimal exploitation of modern spinning technologies. Commercially desirable properties include length, length uniformity, fineness, maturity ratio, decreased fuzz fiber production, micronaire, bundle strength, and single fiber strength. Much effort has been put into the improvement of the characteristics of cotton fibers mainly focusing on fiber length and fiber fineness. In particular, there is a great demand for cotton fibers of specific lengths.

A cotton fiber is composed of a single cell that has differentiated from an epidermal cell of the seed coat, developing through four stages, i.e., initiation, elongation, secondary cell wall thickening and maturation stages. More specifically, the elongation of a cotton fiber commences in the epidermal cell of the ovule immediately following flowering, after which the cotton fiber rapidly elongates for approximately 21 days. Fiber elongation is then terminated, and a secondary cell wall is formed and grown through maturation to become a mature cotton fiber.

Several candidate genes which are associated with the elongation, formation, quality and yield of cotton fibers were disclosed in various patent applications such as U.S. Pat. No. 5,880,100 and U.S. patent application Ser. Nos. 08/580,545, 08/867,484 and 09/262,653 (describing genes involved in cotton fiber elongation stage); WO0245485 (improving fiber quality by modulating sucrose synthase); U.S. Pat. No. 6,472,588 and WO0117333 (increasing fiber quality by transformation with a DNA encoding sucrose phosphate synthase); WO9508914 (using a fiber-specific promoter and a coding sequence encoding cotton peroxidase); WO9626639 (using an ovary specific promoter sequence to express plant growth modifying hormones in cotton ovule tissue, for altering fiber quality characteristics such as fiber dimension and strength); U.S. Pat. Nos. 5,981,834, 5,597, 718, 5,620,882, 5,521,708 and 5,495,070 (coding sequences to alter the fiber characteristics of transgenic fiber producing plants); U.S. patent applications U.S. 2002049999 and U.S. 2003074697 (expressing a gene coding for endoxyloglucan transferase, catalase or peroxidase for improving cotton fiber characteristics); WO 01/40250 (improving cotton fiber quality by modulating transcription factor gene expression); WO 96/40924 (a cotton fiber transcriptional initiation regulatory region associated which is expressed in cotton fiber); EP0834566 (a gene which controls the fiber formation mechanism in cotton plant); WO2005/121364 (improving cotton fiber quality by modulating gene expression); WO2008/075364 (improving fiber quality, yield/biomass/vigor and/or abiotic stress tolerance of plants).

WO publication No. 2004/104162 discloses methods of increasing abiotic stress tolerance and/or biomass in plants and plants generated thereby.

WO publication No. 2004/111183 discloses nucleotide sequences for regulating gene expression in plant trichomes and constructs and methods utilizing same.

WO publication No. 2004/081173 discloses novel plant derived regulatory sequences and constructs and methods of using such sequences for directing expression of exogenous polynucleotide sequences in plants.

WO publication No. 2005/121364 discloses polynucleotides and polypeptides involved in plant fiber development and methods of using same for improving fiber quality, yield and/or biomass of a fiber producing plant.

WO publication No. 2007/049275 discloses isolated polypeptides, polynucleotides encoding same, transgenic plants expressing same and methods of using same for increasing fertilizer use efficiency, plant abiotic stress tolerance and biomass.

WO publication No. 2007/020638 discloses methods of increasing abiotic stress tolerance and/or biomass in plants and plants generated thereby.

WO publication No. 2008/122980 discloses genes constructs and methods for increasing oil content, growth rate and biomass of plants.

WO publication No. 2008/075364 discloses polynucleotides involved in plant fiber development and methods of using same.

WO publication No. 2009/083958 discloses methods of increasing water use efficiency, fertilizer use efficiency, biotic/abiotic stress tolerance, yield and biomass in plant and plants generated thereby.

WO publication No. 2009/141824 discloses isolated polynucleotides and methods using same for increasing plant utility.

WO publication No. 2009/013750 discloses genes, constructs and methods of increasing abiotic stress tolerance, biomass and/or yield in plants generated thereby.

WO publication No. 2010/020941 discloses methods of increasing nitrogen use efficiency, abiotic stress tolerance, yield and biomass in plants and plants generated thereby.

WO publication No. 2010/076756 discloses isolated polynucleotides for increasing abiotic stress tolerance, yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, and/or nitrogen use efficiency of a plant.

WO2010/100595 publication discloses isolated polynucleotides and polypeptides, and methods of using same for increasing plant yield and/or agricultural characteristics.

WO publication No. 2010/049897 discloses isolated polynucleotides and polypeptides and methods of using same for increasing plant yield, biomass, growth rate, vigor, oil content, abiotic stress tolerance of plants and nitrogen use efficiency.

WO2010/143138 publication discloses isolated polynucleotides and polypeptides, and methods of using same for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, abiotic stress tolerance and/or water use efficiency.

WO publication No. 2011/080674 discloses isolated polynucleotides and polypeptides and methods of using same for increasing plant yield, biomass, growth rate, vigor, oil content, abiotic stress tolerance of plants and nitrogen use efficiency.

WO2011/015985 publication discloses polynucleotides and polypeptides for increasing desirable plant qualities.

WO2011/135527 publication discloses isolated polynucleotides and polypeptides for increasing plant yield and/or agricultural characteristics.

WO2012/028993 publication discloses isolated polynucleotides and polypeptides, and methods of using same for increasing nitrogen use efficiency, yield, growth rate, vigor, biomass, oil content, and/or abiotic stress tolerance.

WO2012/085862 publication discloses isolated polynucleotides and polypeptides, and methods of using same for improving plant properties.

WO2012/150598 publication discloses isolated polynucleotides and polypeptides and methods of using same for increasing plant yield, biomass, growth rate, vigor, oil content, abiotic stress tolerance of plants and nitrogen use efficiency.

WO2013/027223 publication discloses isolated polynucleotides and polypeptides, and methods of using same for increasing plant yield and/or agricultural characteristics.

WO2013/080203 publication discloses isolated polynucleotides and polypeptides, and methods of using same for increasing nitrogen use efficiency, yield, growth rate, vigor, biomass, oil content, and/or abiotic stress tolerance.

WO2013/098819 publication discloses isolated polynucleotides and polypeptides, and methods of using same for increasing yield of plants.

WO2013/128448 publication discloses isolated polynucleotides and polypeptides and methods of using same for increasing plant yield, biomass, growth rate, vigor, oil content, abiotic stress tolerance of plants and nitrogen use efficiency.

## SUMMARY OF THE INVENTION

According to an aspect of some embodiments of the present invention there is provided a method of increasing nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant, comprising expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence encoding

a polypeptide at least 80% identical to SEQ ID NO: 496-794, 2898-3645, 3647-4854 or 4855, thereby increasing the nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the plant.

According to an aspect of some embodiments of the present invention there is provided a method of increasing nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant, comprising expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855, thereby increasing the nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the plant.

According to an aspect of some embodiments of the present invention there is provided a method of producing a crop comprising growing a crop plant transformed with an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide at least 80% homologous to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855, wherein the crop plant is derived from plants selected for increased nitrogen use efficiency, increased yield, increased growth rate, increased biomass, increased vigor, increased oil content, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased abiotic stress tolerance as compared to a wild type plant of the same species which is grown under the same growth conditions, and the crop plant having the increased nitrogen use efficiency, increased yield, increased growth rate, increased biomass, increased vigor, increased oil content, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased abiotic stress tolerance, thereby producing the crop.

According to an aspect of some embodiments of the present invention there is provided a method of increasing nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant, comprising expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence at least 80% identical to SEQ ID NO: 1-495, 795-2896 or 2897, thereby increasing the nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the plant.

According to an aspect of some embodiments of the present invention there is provided a method of increasing nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant, comprising expressing within the plant an exogenous polynucleotide comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897, thereby increasing the nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the plant.

According to an aspect of some embodiments of the present invention there is provided a method of producing a

crop comprising growing a crop plant transformed with an exogenous polynucleotide which comprises a nucleic acid sequence which is at least 80% identical to the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897, wherein the crop plant is derived from plants (parent plants) selected for increased nitrogen use efficiency, increased yield, increased growth rate, increased biomass, increased vigor, increased oil content, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased abiotic stress tolerance as compared to a wild type plant of the same species which is grown under the same growth conditions, and the crop plant having the increased nitrogen use efficiency, increased yield, increased growth rate, increased biomass, increased vigor, increased oil content, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased abiotic stress tolerance, thereby producing the crop.

According to an aspect of some embodiments of the present invention there is provided an isolated polynucleotide comprising a nucleic acid sequence encoding a polypeptide which comprises an amino acid sequence at least 80% homologous to the amino acid sequence set forth in SEQ ID NO: 496-794, 2898-3645, 3647-4854 or 4855, wherein the amino acid sequence is capable of increasing nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant.

According to an aspect of some embodiments of the present invention there is provided an isolated polynucleotide comprising a nucleic acid sequence encoding a polypeptide which comprises the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to an aspect of some embodiments of the present invention there is provided an isolated polynucleotide comprising a nucleic acid sequence at least 80% identical to SEQ ID NO: 1-495, 795-2896 or 2897, wherein the nucleic acid sequence is capable of increasing nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant.

According to an aspect of some embodiments of the present invention there is provided an isolated polynucleotide comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

According to an aspect of some embodiments of the present invention there is provided a nucleic acid construct comprising the isolated polynucleotide of some embodiments of the invention, and a promoter for directing transcription of the nucleic acid sequence in a host cell.

According to an aspect of some embodiments of the present invention there is provided an isolated polypeptide comprising an amino acid sequence at least 80% homologous to SEQ ID NO: 496-794, 2898-3645, 3647-4854 or 4855, wherein the amino acid sequence is capable of increasing nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant.

According to an aspect of some embodiments of the present invention there is provided an isolated polypeptide comprising the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

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According to an aspect of some embodiments of the present invention there is provided a plant cell exogenously expressing the polynucleotide of some embodiments of the invention, or the nucleic acid construct of some embodiments of the invention.

According to an aspect of some embodiments of the present invention there is provided a plant cell exogenously expressing the polypeptide of some embodiments of the invention.

According to an aspect of some embodiments of the present invention there is provided a transgenic plant comprising the nucleic acid construct of some embodiments of the invention or the plant cell of some embodiments of the invention.

According to an aspect of some embodiments of the present invention there is provided a method of growing a crop, the method comprising seeding seeds and/or planting plantlets of a plant transformed with the isolated polynucleotide of some embodiments of the invention, or with the nucleic acid construct of some embodiments of the invention, wherein the plant is derived from plants selected for at least one trait selected from the group consisting of: increased nitrogen use efficiency, increased abiotic stress tolerance, increased biomass, increased growth rate, increased vigor, increased yield and increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and increased oil content as compared to a non-transformed plant, thereby growing the crop.

According to an aspect of some embodiments of the present invention there is provided a method of selecting a transformed plant having increased nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to a wild type plant of the same species which is grown under the same growth conditions, the method comprising:

(a) providing plants transformed with an exogenous polynucleotide encoding a polypeptide comprising an amino acid sequence at least 80% homologous to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855,

(b) selecting from the plants a plant having nitrogen use efficiency, increased yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance,

thereby selecting the plant having increased nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to the wild type plant of the same species which is grown under the same growth conditions.

According to an aspect of some embodiments of the present invention there is provided a method of selecting a transformed plant having increased nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to a wild type plant of the same species which is grown under the same growth conditions, the method comprising:

(a) providing plants transformed with an exogenous polynucleotide encoding a polypeptide comprising an amino acid sequence at least 80% identical to the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897,

(b) selecting from the plants a plant having increased nitrogen use efficiency, yield, growth rate, biomass, vigor,

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oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance,

thereby selecting the plant having increased nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to the wild type plant of the same species which is grown under the same growth conditions.

According to some embodiments of the invention, the nucleic acid sequence encodes an amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to some embodiments of the invention, the nucleic acid sequence is selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

According to some embodiments of the invention, the polynucleotide consists of the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

According to some embodiments of the invention, the nucleic acid sequence encodes the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to some embodiments of the invention, the host cell is a plant cell.

According to some embodiments of the invention, the plant cell forms part of a plant.

According to some embodiments of the invention, the method further comprising growing the plant expressing the exogenous polynucleotide under the abiotic stress.

According to some embodiments of the invention, the abiotic stress is selected from the group consisting of salinity, drought, osmotic stress, water deprivation, flood, etiolation, low temperature, high temperature, heavy metal toxicity, anaerobiosis, nutrient deficiency, nitrogen deficiency, nutrient excess, atmospheric pollution and UV irradiation.

According to some embodiments of the invention, the yield comprises seed yield or oil yield.

According to some embodiments of the invention, the method further comprising growing the plant expressing the exogenous polynucleotide under nitrogen-limiting conditions.

According to some embodiments of the invention, the promoter is heterologous to the isolated polynucleotide and/or to the host cell.

According to some embodiments of the invention, the isolated polynucleotide is heterologous to the plant cell.

According to some embodiments of the invention, the non-transformed plant is a wild type plant of identical genetic background.

According to some embodiments of the invention, the non-transformed plant is a wild type plant of the same species.

According to some embodiments of the invention, the non-transformed plant is grown under identical growth conditions.

According to some embodiments of the invention, the method further comprising selecting a plant having an increased nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to the wild type plant of the same species which is grown under the same growth conditions.

Unless otherwise defined, all technical and/or scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the

invention pertains. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of embodiments of the invention, exemplary methods and/or materials are described below. In case of conflict, the patent specification, including definitions, will control. In addition, the materials, methods, and examples are illustrative only and are not intended to be necessarily limiting.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Some embodiments of the invention are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of embodiments of the invention. In this regard, the description taken with the drawings makes apparent to those skilled in the art how embodiments of the invention may be practiced.

In the drawings:

FIG. 1 is a schematic illustration of the modified pGI binary plasmid containing the new At6669 promoter (SEQ ID NO:4880) and the GUSintron (pQYN 6669) used for expressing the isolated polynucleotide sequences of the invention. RB—T-DNA right border; LB—T-DNA left border; MCS—Multiple cloning site; RE—any restriction enzyme; NOS pro=nopaline synthase promoter; NPT-II=neomycin phosphotransferase gene; NOS ter=nopaline synthase terminator; Poly-A signal (polyadenylation signal); GUSintron—the GUS reporter gene (coding sequence and intron). The isolated polynucleotide sequences of the invention were cloned into the vector while replacing the GUSintron reporter gene.

FIG. 2 is a schematic illustration of the modified pGI binary plasmid containing the new At6669 promoter (SEQ ID NO: 4880) (pQFN or pQFNc) used for expressing the isolated polynucleotide sequences of the invention. RB—T-DNA right border; LB—T-DNA left border; MCS—Multiple cloning site; RE—any restriction enzyme; NOS pro=nopaline synthase promoter; NPT-II=neomycin phosphotransferase gene; NOS ter=nopaline synthase terminator; Poly-A signal (polyadenylation signal); The isolated polynucleotide sequences of the invention were cloned into the MCS of the vector.

FIGS. 3A-F are images depicting visualization of root development of transgenic plants exogenously expressing the polynucleotide of some embodiments of the invention when grown in transparent agar plates under normal (FIGS. 3A-B), osmotic stress (15% PEG; FIGS. 3C-D) or nitrogen-limiting (FIGS. 3E-F) conditions. The different transgenes were grown in transparent agar plates for 17 days (7 days nursery and 10 days after transplanting). The plates were photographed every 3-4 days starting at day 1 after transplanting. FIG. 3A—An image of a photograph of plants taken following 10 after transplanting days on agar plates when grown under normal (standard) conditions. FIG. 3B—An image of root analysis of the plants shown in FIG. 3A in which the lengths of the roots measured are represented by arrows. FIG. 3C—An image of a photograph of plants taken following 10 days after transplanting on agar plates, grown under high osmotic (PEG 15%) conditions. FIG. 3D—An image of root analysis of the plants shown in FIG. 3C in which the lengths of the roots measured are represented by arrows. FIG. 3E—An image of a photograph of plants taken following 10 days after transplanting on agar plates, grown under low nitrogen conditions. FIG. 3F—An

image of root analysis of the plants shown in FIG. 3E in which the lengths of the roots measured are represented by arrows.

FIG. 4 is a schematic illustration of the modified pGI binary plasmid containing the Root Promoter (pQNa RP) used for expressing the isolated polynucleotide sequences of the invention. RB—T-DNA right border; LB—T-DNA left border; NOS pro=nopaline synthase promoter; NPT-II=neomycin phosphotransferase gene; NOS ter=nopaline synthase terminator; Poly-A signal (polyadenylation signal); The isolated polynucleotide sequences according to some embodiments of the invention were cloned into the MCS (Multiple cloning site) of the vector.

FIG. 5 is a schematic illustration of the pQYN plasmid.

FIG. 6 is a schematic illustration of the pQFN plasmid.

FIG. 7 is a schematic illustration of the pQFYN plasmid.

FIG. 8 is a schematic illustration of the modified pGI binary plasmid (pQXNc) used for expressing the isolated polynucleotide sequences of some embodiments of the invention. RB—T-DNA right border; LB—T-DNA left border; NOS pro=nopaline synthase promoter; NPT-II=neomycin phosphotransferase gene; NOS ter=nopaline synthase terminator; RE=any restriction enzyme; Poly-A signal (polyadenylation signal); 35S—the 35S promoter (pQfnc; SEQ ID NO: 4876). The isolated polynucleotide sequences of some embodiments of the invention were cloned into the MCS (Multiple cloning site) of the vector.

FIGS. 9A-B are schematic illustrations of the pEBbVNi tDNA (FIG. 9A) and the pEBbNi tDNA (FIG. 9B) plasmids used in the *Brachypodium* experiments. pEBbVNi tDNA (FIG. 9A) was used for expression of the isolated polynucleotide sequences of some embodiments of the invention in *Brachypodium*. pEBbNi tDNA (FIG. 9B) was used for transformation into *Brachypodium* as a negative control. “RB”=right border; “2LBregion”=2 repeats of left border; “35S”=35S promoter (SEQ ID NO:4892); “NOS ter”=nopaline synthase terminator; “Bar ORF”—BAR open reading frame (GenBank Accession No. JQ293091.1; SEQ ID NO:5436); The isolated polynucleotide sequences of some embodiments of the invention were cloned into the Multiple cloning site of the vector using one or more of the indicated restriction enzyme sites.

#### DESCRIPTION OF SPECIFIC EMBODIMENTS OF THE INVENTION

The present inventors have identified novel polypeptides and polynucleotides which can be used to generate nucleic acid constructs, transgenic plants and to increase nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, abiotic stress tolerance and/or water use efficiency of a plant.

Thus, as shown in the Examples section which follows, the present inventors have utilized bioinformatics tools to identify polynucleotides which enhance/increase fertilizer use efficiency (e.g., nitrogen use efficiency), yield (e.g., seed yield, oil yield, oil content), growth rate, biomass, vigor, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant. Genes which affect the trait-of-interest were identified (SEQ ID NOs: 496-794) for polypeptides; and SEQ ID NOs: 1-495 (for polynucleotides) based on expression profiles of genes of several *Arabidopsis*, Barley, *Sorghum*, Maize, tomato, and Foxtail millet ecotypes and accessions in various tissues and growth conditions, homology with genes known to affect the trait-of-interest and using digital expression profile in spe-

cific tissues and conditions (Tables 1, and 3-99, Examples 1 and 3-11 of the Examples section which follows). Homologous (e.g., orthologous) polypeptides and polynucleotides having the same function were also identified [SEQ ID NOs: 2898-4855 (for polypeptides), and SEQ ID NOs: 795-2897 (for polynucleotides); Table 2, Example 2 of the Examples section which follows]. The polynucleotides of some embodiments of the invention were cloned into binary vectors (Example 12, Table 100), and were further transformed into *Arabidopsis* and *Brachypodium* plants (Examples 13-15). Transgenic plants over-expressing the identified polynucleotides were found to exhibit increased biomass, growth rate, vigor and yield under normal growth conditions or under nitrogen limiting growth conditions (Tables 101-128; Examples 16-20), and increased tolerance to abiotic stress conditions (e.g., nutrient deficiency) as compared to control plants grown under the same growth conditions. Altogether, these results suggest the use of the novel polynucleotides and polypeptides of the invention (e.g., SEQ ID NOs: 496-794 and 2898-4855 and SEQ ID NOs: 1-495 and 795-2897) for increasing nitrogen use efficiency, fertilizer use efficiency, yield (e.g., oil yield, seed yield and oil content), growth rate, biomass, vigor, fiber yield, fiber quality, fiber length, photosynthetic capacity, water use efficiency and/or abiotic stress tolerance of a plant.

Thus, according to an aspect of some embodiments of the invention, there is provided method of increasing fertilizer use efficiency (e.g., nitrogen use efficiency), oil content, yield, growth rate, biomass, vigor, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant, comprising expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% homologous to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855, thereby increasing the fertilizer use efficiency (e.g., nitrogen use efficiency), oil content, yield, growth rate, biomass, vigor, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the plant.

As used herein the phrase "plant yield" refers to the amount (e.g., as determined by weight or size) or quantity (numbers) of tissues or organs produced per plant or per growing season. Hence increased yield could affect the economic benefit one can obtain from the plant in a certain growing area and/or growing time.

It should be noted that a plant yield can be affected by various parameters including, but not limited to, plant biomass; plant vigor; growth rate; seed yield; seed or grain quantity; seed or grain quality; oil yield; content of oil, starch and/or protein in harvested organs (e.g., seeds or vegetative parts of the plant); number of flowers (florets) per panicle (expressed as a ratio of number of filled seeds over number of primary panicles); harvest index; number of plants grown per area; number and size of harvested organs per plant and per area; number of plants per growing area (density); number of harvested organs in field; total leaf area; carbon assimilation and carbon partitioning (the distribution/allocation of carbon within the plant); resistance to shade; number of harvestable organs (e.g. seeds), seeds per pod, weight per seed; and modified architecture [such as

increase stalk diameter, thickness or improvement of physical properties (e.g. elasticity)].

As used herein the phrase "seed yield" refers to the number or weight of the seeds per plant, seeds per pod, or per growing area or to the weight of a single seed, or to the oil extracted per seed. Hence seed yield can be affected by seed dimensions (e.g., length, width, perimeter, area and/or volume), number of (filled) seeds and seed filling rate and by seed oil content. Hence increase seed yield per plant could affect the economic benefit one can obtain from the plant in a certain growing area and/or growing time; and increase seed yield per growing area could be achieved by increasing seed yield per plant, and/or by increasing number of plants grown on the same given area.

The term "seed" (also referred to as "grain" or "kernel") as used herein refers to a small embryonic plant enclosed in a covering called the seed coat (usually with some stored food), the product of the ripened ovule of gymnosperm and angiosperm plants which occurs after fertilization and some growth within the mother plant.

The phrase "oil content" as used herein refers to the amount of lipids in a given plant organ, either the seeds (seed oil content) or the vegetative portion of the plant (vegetative oil content) and is typically expressed as percentage of dry weight (10% humidity of seeds) or wet weight (for vegetative portion).

It should be noted that oil content is affected by intrinsic oil production of a tissue (e.g., seed, vegetative portion), as well as the mass or size of the oil-producing tissue per plant or per growth period.

In one embodiment, increase in oil content of the plant can be achieved by increasing the size/mass of a plant's tissue(s) which comprise oil per growth period. Thus, increased oil content of a plant can be achieved by increasing the yield, growth rate, biomass and vigor of the plant.

As used herein the phrase "plant biomass" refers to the amount (e.g., measured in grams of air-dry tissue) of a tissue produced from the plant in a growing season, which could also determine or affect the plant yield or the yield per growing area. An increase in plant biomass can be in the whole plant or in parts thereof such as aboveground (harvestable) parts, vegetative biomass, roots and seeds.

As used herein the phrase "growth rate" refers to the increase in plant organ/tissue size per time (can be measured in cm<sup>2</sup> per day or cm/day).

As used herein the phrase "photosynthetic capacity" (also known as " $A_{max}$ ") is a measure of the maximum rate at which leaves are able to fix carbon during photosynthesis. It is typically measured as the amount of carbon dioxide that is fixed per square meter per second, for example as  $\mu\text{mol m}^{-2} \text{sec}^{-1}$ . Plants are able to increase their photosynthetic capacity by several modes of action, such as by increasing the total leaves area (e.g., by increase of leaves area, increase in the number of leaves, and increase in plant's vigor, e.g., the ability of the plant to grow new leaves along time course) as well as by increasing the ability of the plant to efficiently execute carbon fixation in the leaves. Hence, the increase in total leaves area can be used as a reliable measurement parameter for photosynthetic capacity increment.

As used herein the phrase "plant vigor" refers to the amount (measured by weight) of tissue produced by the plant in a given time. Hence increased vigor could determine or affect the plant yield or the yield per growing time or growing area. In addition, early vigor (seed and/or seedling) results in improved field stand.

Improving early vigor is an important objective of modern rice breeding programs in both temperate and tropical rice

cultivars. Long roots are important for proper soil anchorage in water-seeded rice. Where rice is sown directly into flooded fields, and where plants must emerge rapidly through water, longer shoots are associated with vigour. Where drill-seeding is practiced, longer mesocotyls and coleoptiles are important for good seedling emergence. The ability to engineer early vigor into plants would be of great importance in agriculture. For example, poor early vigor has been a limitation to the introduction of maize (*Zea mays* L.) hybrids based on Corn Belt germplasm in the European Atlantic.

It should be noted that a plant yield can be determined under stress (e.g., abiotic stress, nitrogen-limiting conditions) and/or non-stress (normal) conditions.

As used herein, the phrase "non-stress conditions" refers to the growth conditions (e.g., water, temperature, light-dark cycles, humidity, salt concentration, fertilizer concentration in soil, nutrient supply such as nitrogen, phosphorous and/or potassium), that do not significantly go beyond the everyday climatic and other abiotic conditions that plants may encounter, and which allow optimal growth, metabolism, reproduction and/or viability of a plant at any stage in its life cycle (e.g., in a crop plant from seed to a mature plant and back to seed again). Persons skilled in the art are aware of normal soil conditions and climatic conditions for a given plant in a given geographic location. It should be noted that while the non-stress conditions may include some mild variations from the optimal conditions (which vary from one type/species of a plant to another), such variations do not cause the plant to cease growing without the capacity to resume growth.

The phrase "abiotic stress" as used herein refers to any adverse effect on metabolism, growth, reproduction and/or viability of a plant. Accordingly, abiotic stress can be induced by suboptimal environmental growth conditions such as, for example, salinity, osmotic stress, water deprivation, drought, flooding, freezing, low or high temperature, heavy metal toxicity, anaerobiosis, nutrient deficiency (e.g., nitrogen deficiency or limited nitrogen), atmospheric pollution or UV irradiation. The implications of abiotic stress are discussed in the Background section.

The phrase "abiotic stress tolerance" as used herein refers to the ability of a plant to endure an abiotic stress without suffering a substantial alteration in metabolism, growth, productivity and/or viability.

Plants are subject to a range of environmental challenges. Several of these, including salt stress, general osmotic stress, drought stress and freezing stress, have the ability to impact whole plant and cellular water availability. Not surprisingly, then, plant responses to this collection of stresses are related. Zhu (2002) Ann Rev. Plant Biol. 53: 247-273 et al. note that "most studies on water stress signaling have focused on salt stress primarily because plant responses to salt and drought are closely related and the mechanisms overlap". Many examples of similar responses and pathways to this set of stresses have been documented. For example, the CBF transcription factors have been shown to condition resistance to salt, freezing and drought (Kasuga et al. (1999) Nature Biotech. 17: 287-291). The *Arabidopsis* rd29B gene is induced in response to both salt and dehydration stress, a process that is mediated largely through an ABA signal transduction process (Uno et al. (2000) Proc. Natl. Acad. Sci. USA 97: 11632-11637), resulting in altered activity of transcription factors that bind to an upstream element within the rd29B promoter. In *Mesembryanthemum crystallinum* (ice plant), Patharker and Cushman have shown that a calcium-dependent protein kinase (McCDPK1) is induced

by exposure to both drought and salt stresses (Patharker and Cushman (2000) Plant J. 24: 679-691). The stress-induced kinase was also shown to phosphorylate a transcription factor, presumably altering its activity, although transcript levels of the target transcription factor are not altered in response to salt or drought stress. Similarly, Saijo et al. demonstrated that a rice salt/drought-induced calmodulin-dependent protein kinase (OsCDPK7) conferred increased salt and drought tolerance to rice when overexpressed (Saijo et al. (2000) Plant J. 23: 319-327).

Exposure to dehydration invokes similar survival strategies in plants as does freezing stress (see, for example, Yelenosky (1989) Plant Physiol 89: 444-451) and drought stress induces freezing tolerance (see, for example, Siminovich et al. (1982) Plant Physiol 69: 250-255; and Guy et al. (1992) Planta 188: 265-270). In addition to the induction of cold-acclimation proteins, strategies that allow plants to survive in low water conditions may include, for example, reduced surface area, or surface oil or wax production. In another example increased solute content of the plant prevents evaporation and water loss due to heat, drought, salinity, osmoticum, and the like therefore providing a better plant tolerance to the above stresses.

It will be appreciated that some pathways involved in resistance to one stress (as described above), will also be involved in resistance to other stresses, regulated by the same or homologous genes. Of course, the overall resistance pathways are related, not identical, and therefore not all genes controlling resistance to one stress will control resistance to the other stresses. Nonetheless, if a gene conditions resistance to one of these stresses, it would be apparent to one skilled in the art to test for resistance to these related stresses. Methods of assessing stress resistance are further provided in the Examples section which follows.

As used herein the phrase "water use efficiency (WUE)" refers to the level of organic matter produced per unit of water consumed by the plant, i.e., the dry weight of a plant in relation to the plant's water use, e.g., the biomass produced per unit transpiration.

As used herein the phrase "fertilizer use efficiency" refers to the metabolic process(es) which lead to an increase in the plant's yield, biomass, vigor, and growth rate per fertilizer unit applied. The metabolic process can be the uptake, spread, absorbent, accumulation, relocation (within the plant) and use of one or more of the minerals and organic moieties absorbed by the plant, such as nitrogen, phosphates and/or potassium.

As used herein the phrase "fertilizer-limiting conditions" refers to growth conditions which include a level (e.g., concentration) of a fertilizer applied which is below the level needed for normal plant metabolism, growth, reproduction and/or viability.

As used herein the phrase "nitrogen use efficiency (NUE)" refers to the metabolic process(es) which lead to an increase in the plant's yield, biomass, vigor, and growth rate per nitrogen unit applied. The metabolic process can be the uptake, spread, absorbent, accumulation, relocation (within the plant) and use of nitrogen absorbed by the plant.

As used herein the phrase "nitrogen-limiting conditions" refers to growth conditions which include a level (e.g., concentration) of nitrogen (e.g., ammonium or nitrate) applied which is below the level needed for normal plant metabolism, growth, reproduction and/or viability.

Improved plant NUE and FUE is translated in the field into either harvesting similar quantities of yield, while implementing less fertilizers, or increased yields gained by implementing the same levels of fertilizers. Thus, improved

NUE or FUE has a direct effect on plant yield in the field. Thus, the polynucleotides and polypeptides of some embodiments of the invention positively affect plant yield, seed yield, and plant biomass. In addition, the benefit of improved plant NUE will certainly improve crop quality and biochemical constituents of the seed such as protein yield and oil yield.

It should be noted that improved ABST will confer plants with improved vigor also under non-stress conditions, resulting in crops having improved biomass and/or yield e.g., elongated fibers for the cotton industry, higher oil content.

The term “fiber” is usually inclusive of thick-walled conducting cells such as vessels and tracheids and to fibrillar aggregates of many individual fiber cells. Hence, the term “fiber” refers to (a) thick-walled conducting and non-conducting cells of the xylem; (b) fibers of extraxylary origin, including those from phloem, bark, ground tissue, and epidermis; and (c) fibers from stems, leaves, roots, seeds, and flowers or inflorescences (such as those of *Sorghum vulgare* used in the manufacture of brushes and brooms).

Example of fiber producing plants, include, but are not limited to, agricultural crops such as cotton, silk cotton tree (Kapok, *Ceiba pentandra*), desert willow, creosote bush, winterfat, balsa, kenaf, roselle, jute, sisal abaca, flax, corn, sugar cane, hemp, ramie, kapok, coir, bamboo, spanish moss and *Agave* spp. (e.g. sisal).

As used herein the phrase “fiber quality” refers to at least one fiber parameter which is agriculturally desired, or required in the fiber industry (further described hereinbelow). Examples of such parameters, include but are not limited to, fiber length, fiber strength, fiber fitness, fiber weight per unit length, maturity ratio and uniformity (further described hereinbelow).

Cotton fiber (lint) quality is typically measured according to fiber length, strength and fineness. Accordingly, the lint quality is considered higher when the fiber is longer, stronger and finer.

As used herein the phrase “fiber yield” refers to the amount or quantity of fibers produced from the fiber producing plant.

As used herein the term “increasing” refers to at least about 2%, at least about 3%, at least about 4%, at least about 5%, at least about 10%, at least about 15%, at least about 20%, at least about 30%, at least about 40%, at least about 50%, at least about 60%, at least about 70%, at least about 80%, increase in fertilizer use efficiency, nitrogen use efficiency, yield, seed yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant as compared to a native plant or a wild type plant [i.e., a plant not modified with the biomolecules (polynucleotide or polypeptides) of the invention, e.g., a non-transformed plant of the same species which is grown under the same (e.g., identical) growth conditions].

The phrase “expressing within the plant an exogenous polynucleotide” as used herein refers to upregulating the expression level of an exogenous polynucleotide within the plant by introducing the exogenous polynucleotide into a plant cell or plant and expressing by recombinant means, as further described herein below.

As used herein “expressing” refers to expression at the mRNA and optionally polypeptide level.

As used herein, the phrase “exogenous polynucleotide” refers to a heterologous nucleic acid sequence which may not be naturally expressed within the plant (e.g., a nucleic acid sequence from a different species) or which overex-

pression in the plant is desired. The exogenous polynucleotide may be introduced into the plant in a stable or transient manner, so as to produce a ribonucleic acid (RNA) molecule and/or a polypeptide molecule. It should be noted that the exogenous polynucleotide may comprise a nucleic acid sequence which is identical or partially homologous to an endogenous nucleic acid sequence of the plant.

The term “endogenous” as used herein refers to any polynucleotide or polypeptide which is present and/or naturally expressed within a plant or a cell thereof.

According to some embodiments of the invention, the exogenous polynucleotide of the invention comprises a nucleic acid sequence encoding a polypeptide having an amino acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% homologous to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855.

Homologous sequences include both orthologous and paralogous sequences. The term “paralogous” relates to gene-duplications within the genome of a species leading to paralogous genes. The term “orthologous” relates to homologous genes in different organisms due to ancestral relationship. Thus, orthologs are evolutionary counterparts derived from a single ancestral gene in the last common ancestor of given two species (Koonin E V and Galperin M Y (Sequence-Evolution-Function: Computational Approaches in Comparative Genomics, Boston: Kluwer Academic; 2003. Chapter 2, Evolutionary Concept in Genetics and Genomics. Available from: [ncbi\(dot\)nml\(dot\)nih\(dot\)gov/books/NBK20255](http://ncbi(dot)nml(dot)nih(dot)gov/books/NBK20255)) and therefore have great likelihood of having the same function.

One option to identify orthologues in monocot plant species is by performing a reciprocal blast search. This may be done by a first blast involving blasting the sequence-of-interest against any sequence database, such as the publicly available NCBI database which may be found at: [ncbi\(dot\)nml\(dot\)nih\(dot\)gov](http://ncbi(dot)nml(dot)nih(dot)gov). If orthologues in rice were sought, the sequence-of-interest would be blasted against, for example, the 28,469 full-length cDNA clones from *Oryza sativa* Nipponbare available at NCBI. The blast results may be filtered. The full-length sequences of either the filtered results or the non-filtered results are then blasted back (second blast) against the sequences of the organism from which the sequence-of-interest is derived. The results of the first and second blasts are then compared. An orthologue is identified when the sequence resulting in the highest score (best hit) in the first blast identifies in the second blast the query sequence (the original sequence-of-interest) as the best hit. Using the same rational a paralogue (homolog to a gene in the same organism) is found. In case of large sequence families, the ClustalW program may be used [[ebidot.ac\(dot\)uk/Tools/clustalw2/index\(dot\)html](http://ebidot.ac(dot)uk/Tools/clustalw2/index(dot)html)], followed by a neighbor-joining tree ([wikipedia\(dot\)org/wiki/Neighbor-joining](http://wikipedia(dot)org/wiki/Neighbor-joining)) which helps visualizing the clustering.

Homology (e.g., percent homology, sequence identity+ sequence similarity) can be determined using any homology comparison software computing a pairwise sequence alignment.

As used herein, “sequence identity” or “identity” in the context of two nucleic acid or polypeptide sequences includes reference to the residues in the two sequences

which are the same when aligned. When percentage of sequence identity is used in reference to proteins it is recognized that residue positions which are not identical often differ by conservative amino acid substitutions, where amino acid residues are substituted for other amino acid residues with similar chemical properties (e.g. charge or hydrophobicity) and therefore do not change the functional properties of the molecule. Where sequences differ in conservative substitutions, the percent sequence identity may be adjusted upwards to correct for the conservative nature of the substitution. Sequences which differ by such conservative substitutions are said to have "sequence similarity" or "similarity". Means for making this adjustment are well-known to those of skill in the art. Typically this involves scoring a conservative substitution as a partial rather than a full mismatch, thereby increasing the percentage sequence identity. Thus, for example, where an identical amino acid is given a score of 1 and a non-conservative substitution is given a score of zero, a conservative substitution is given a score between zero and 1. The scoring of conservative substitutions is calculated, e.g., according to the algorithm of Henikoff S and Henikoff J G. [Amino acid substitution matrices from protein blocks. *Proc. Natl. Acad. Sci. U.S.A.* 1992, 89(22): 10915-9].

Identity (e.g., percent homology) can be determined using any homology comparison software, including for example, the BlastN software of the National Center of Biotechnology Information (NCBI) such as by using default parameters.

According to some embodiments of the invention, the identity is a global identity, i.e., an identity over the entire amino acid or nucleic acid sequences of the invention and not over portions thereof.

According to some embodiments of the invention, the term "homology" or "homologous" refers to identity of two or more nucleic acid sequences; or identity of two or more amino acid sequences; or the identity of an amino acid sequence to one or more nucleic acid sequence.

According to some embodiments of the invention, the homology is a global homology, i.e., an homology over the entire amino acid or nucleic acid sequences of the invention and not over portions thereof.

The degree of homology or identity between two or more sequences can be determined using various known sequence comparison tools. Following is a non-limiting description of such tools which can be used along with some embodiments of the invention.

Pairwise global alignment was defined by S. B. Needleman and C. D. Wunsch, "A general method applicable to the search of similarities in the amino acid sequence of two proteins" *Journal of Molecular Biology*, 1970, pages 443-53, volume 48).

For example, when starting from a polypeptide sequence and comparing to other polypeptide sequences, the EMBOSS-6.0.1 Needleman-Wunsch algorithm (available from `emboss(dot)sourceforge(dot)net/apps/cvs/emboss/apps/needle(dot)html`) can be used to find the optimum alignment (including gaps) of two sequences along their entire length—a "Global alignment". Default parameters for Needleman-Wunsch algorithm (EMBOSS-6.0.1) include: `gapopen=10; gapextend=0.5; datafile=EBLOSUM62; brief=YES`.

According to some embodiments of the invention, the parameters used with the EMBOSS-6.0.1 tool (for protein-protein comparison) include: `gapopen=8; gapextend=2; datafile=EBLOSUM62; brief=YES`.

According to some embodiments of the invention, the threshold used to determine homology using the EMBOSS-

6.0.1 Needleman-Wunsch algorithm is 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100%.

When starting from a polypeptide sequence and comparing to polynucleotide sequences, the OneModel FramePlus algorithm [Halperin, E., Faigler, S. and Gill-More, R. (1999)—FramePlus: aligning DNA to protein sequences. *Bioinformatics*, 15, 867-873] (available from `bioceleration(dot)com/Products(dot)html`) can be used with following default parameters: `model=frame+_p2n.model mode=local`. According to some embodiments of the invention, the parameters used with the OneModel FramePlus algorithm are `model=frame+_p2n.model, mode=qglobal`.

According to some embodiments of the invention, the threshold used to determine homology using the OneModel FramePlus algorithm is 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100%.

When starting with a polynucleotide sequence and comparing to other polynucleotide sequences the EMBOSS-6.0.1 Needleman-Wunsch algorithm (available from `emboss(dot)sourceforge(dot)net/apps/cvs/emboss/apps/needle(dot)html`) can be used with the following default parameters: (EMBOSS-6.0.1) `gapopen=10; gapextend=0.5; datafile=EDNAFULL; brief=YES`.

According to some embodiments of the invention, the parameters used with the EMBOSS-6.0.1 Needleman-Wunsch algorithm are `gapopen=10; gapextend=0.2; datafile=EDNAFULL; brief=YES`.

According to some embodiments of the invention, the threshold used to determine homology using the EMBOSS-6.0.1 Needleman-Wunsch algorithm for comparison of polynucleotides with polynucleotides is 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100%.

According to some embodiment, determination of the degree of homology further requires employing the Smith-Waterman algorithm (for protein-protein comparison or nucleotide-nucleotide comparison).

Default parameters for GenCore 6.0 Smith-Waterman algorithm include: `model=sw.model`.

According to some embodiments of the invention, the threshold used to determine homology using the Smith-Waterman algorithm is 80%, 81%, 82%, 83%, 84%, 85%, 86%, 87%, 88%, 89%, 90%, 91%, 92%, 93%, 94%, 95%, 96%, 97%, 98%, 99%, or 100%.

According to some embodiments of the invention, the global homology is performed on sequences which are pre-selected by local homology to the polypeptide or polynucleotide of interest (e.g., 60% identity over 60% of the sequence length), prior to performing the global homology to the polypeptide or polynucleotide of interest (e.g., 80% global homology on the entire sequence). For example, homologous sequences are selected using the BLAST software with the Blastp and tBlastn algorithms as filters for the first stage, and the needle (EMBOSS package) or Frame+ algorithm alignment for the second stage. Local identity (Blast alignments) is defined with a very permissive cut-off—60% Identity on a span of 60% of the sequences lengths because it is used only as a filter for the global alignment stage. In this specific embodiment (when the local identity is used), the default filtering of the Blast package is not utilized (by setting the parameter "-F F").

In the second stage, homologs are defined based on a global identity of at least 80% to the core gene polypeptide sequence.

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According to some embodiments of the invention, two distinct forms for finding the optimal global alignment for protein or nucleotide sequences are used:

1. Between two proteins (following the blastp filter): EMBOSS-6.0.1 Needleman-Wunsch algorithm with the following modified parameters: gapopen=8 gapextend=2. The rest of the parameters are unchanged from the default options listed here:

Standard (Mandatory) qualifiers:

[-asequence] sequence Sequence filename and optional format, or reference (input USA)

[-bsequence] seqall Sequence(s) filename and optional format, or reference (input USA)

-gapopen float [10.0 for any sequence]. The gap open penalty is the score taken away when a gap is created. The best value depends on the choice of comparison matrix. The default value assumes you are using the EBLOSUM62 matrix for protein sequences, and the EDNAFULL matrix for nucleotide sequences. (Floating point number from 1.0 to 100.0)

-gapextend float [0.5 for any sequence]. The gap extension, penalty is added to the standard gap penalty for each base or residue in the gap. This is how long gaps are penalized. Usually you will expect a few long gaps rather than many short gaps, so the gap extension penalty should be lower than the gap penalty. An exception is where one or both sequences are single reads with possible sequencing errors in which case you would expect many single base gaps. You can get this result by setting the gap open penalty to zero (or very low) and using the gap extension penalty to control gap scoring. (Floating point number from 0.0 to 10.0)

[-outfile] align [\*needle] Output alignment file name

Additional (Optional) qualifiers:

-datafile matrixf [EBLOSUM62 for protein, EDNAFULL for DNA]. This is the scoring matrix file used when comparing sequences. By default it is the file 'EBLOSUM62' (for proteins) or the file 'EDNAFULL' (for nucleic sequences). These files are found in the 'data' directory of the EMBOSS installation.

Advanced (Unprompted) Qualifiers:

[-no]brief boolean [Y] Brief identity and similarity

Associated qualifiers:

"-asequence" associated qualifiers

-sbegin1 integer Start of the sequence to be used

-send1 integer End of the sequence to be used

-sreverse1 boolean Reverse (if DNA)

-sask1 boolean Ask for begin/end/reverse

-snucleotide1 boolean Sequence is nucleotide

-sprotein1 boolean Sequence is protein

-slower1 boolean Make lower case

-supper1 boolean Make upper case

-sformat1 string Input sequence format

-sdbname1 string Database name

-sid1 string Entryname

-ufo1 string UFO features

-fformat1 string Features format

-fopenfile1 string Features file name

"-bsequence" associated qualifiers

-sbegin2 integer Start of each sequence to be used

-send2 integer End of each sequence to be used

-sreverse2 boolean Reverse (if DNA)

-sask2 boolean Ask for begin/end/reverse

-snucleotide2 boolean Sequence is nucleotide

-sprotein2 boolean Sequence is protein

-slower2 boolean Make lower case

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-supper2 boolean Make upper case

-sformat2 string Input sequence format

-sdbname2 string Database name

-sid2 string Entryname

-ufo2 string UFO features

-fformat2 string Features format

-fopenfile2 string Features file name

"-outfile" associated qualifiers

-aformat3 string Alignment format

-aextension3 string File name extension

-aname3 string Base file name

-awidth3 integer Alignment width

-aaccshow3 boolean Show accession number in the header

-adesshow3 boolean Show description in the header

-ausashow3 boolean Show the full USA in the alignment

-aglobal3 boolean Show the full sequence in alignment

General qualifiers:

-auto boolean Turn off prompts

-stdout boolean Write first file to standard output

-filter boolean Read first file from standard input, write first file to standard output

-options boolean Prompt for standard and additional values

-debug boolean Write debug output to program.dbg

-verbose boolean Report some/full command line options

-help boolean Report command line options. More information on associated and general qualifiers can be found with -help -verbose

-warning boolean Report warnings

-error boolean Report errors

-fatal boolean Report fatal errors

-die boolean Report dying program messages

2. Between a protein sequence and a nucleotide sequence (following the tblastn filter): GenCore 6.0 OneModel application utilizing the Frame+ algorithm with the following parameters: model=frame+\_p2n.model mode=qglobal -q=protein.sequence -db=nucleotide.sequence. The rest of the parameters are unchanged from the default options:

Usage:

om -model=<model\_fname> [-q=query] [-db=]database [options]

- 45 -model=<model\_fname> Specifies the model that you want to run. All models supplied by Compugen are located in the directory \$CGNROOT/models/.

Valid Command Line Parameters:

-dev=<dev\_name> Selects the device to be used by the application.

Valid devices are:

bic—Biocelerator (valid for SW, XSW, FRAME\_N2P, and FRAME\_P2N models).

xlg—BioXL/G (valid for all models except XSW).

- 55 xlp—BioXL/P (valid for SW, FRAME+\_N2P, and FRAME\_P2N models).

xlh—BioXL/H (valid for SW, FRAME+\_N2P, and FRAME\_P2N models).

soft—Software device (for all models).

- 60 -q=<query> Defines the query set. The query can be a sequence file or a database reference. You can specify a query by its name or by accession number. The format is detected automatically. However, you may specify a format using the -qfmt parameter. If you do not specify a query, the program prompts for one. If the query set is a database reference, an output file is produced for each sequence in the query.
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-db=<database name> Chooses the database set. The database set can be a sequence file or a database reference. The database format is detected automatically. However, you may specify a format using -dfmt parameter.

-qacc Add this parameter to the command line if you specify query using accession numbers.

-dacc Add this parameter to the command line if you specify a database using accession numbers.

-dfmt/-qfmt=<format\_type> Chooses the database/query format type. Possible formats are:

- fasta—fasta with seq type auto-detected.
- fastap—fasta protein seq.
- fastan—fasta nucleic seq.
- gcg—gcg format, type is auto-detected.
- gcg9seq—gcg9 format, type is auto-detected.
- gcg9seqp—gcg9 format protein seq.
- gcg9seqn—gcg9 format nucleic seq.
- nbrf—nbrf seq, type is auto-detected.
- nbrfp—nbrf protein seq.
- nbrfn—nbrf nucleic seq.
- embl—embl and swissprot format.
- genbank—genbank format (nucleic).
- blast—blast format.
- nbrf\_gcg—nbrf-gcg seq, type is auto-detected.
- nbrf\_gcgp—nbrf-gcg protein seq.
- nbrf\_gcgn—nbrf-gcg nucleic seq.
- raw—raw ascii sequence, type is auto-detected.
- rawp—raw ascii protein sequence.
- rawn—raw ascii nucleic sequence.
- pir—pir codata format, type is auto-detected.
- profile—gcg profile (valid only for -qfmt in SW, XSW, FRAME\_P2N, and FRAME+\_P2N).

-out=<out\_fname> The name of the output file.

-suffix=<name> The output file name suffix.

-gapop=<n> Gap open penalty. This parameter is not valid for FRAME+. For FrameSearch the default is 12.0. For other searches the default is 10.0.

-gapext=<n> Gap extend penalty. This parameter is not valid for FRAME+. For FrameSearch the default is 4.0. For other models: the default for protein searches is 0.05, and the default for nucleic searches is 1.0.

-qgapop=<n> The penalty for opening a gap in the query sequence. The default is 10.0. Valid for XSW.

-qgapext=<n> The penalty for extending a gap in the query sequence. The default is 0.05. Valid for XSW.

-start=<n> The position in the query sequence to begin the search.

-end=<n> The position in the query sequence to stop the search.

-qtrans Performs a translated search, relevant for a nucleic query against a protein database. The nucleic query is translated to six reading frames and a result is given for each frame.

Valid for SW and XSW.

-dtrans Performs a translated search, relevant for a protein query against a DNA database. Each database entry is translated to six reading frames and a result is given for each frame.

Valid for SW and XSW.

Note: “-qtrans” and “-dtrans” options are mutually exclusive.

-matrix=<matrix\_file> Specifies the comparison matrix to be used in the search. The matrix must be in the BLAST format. If the matrix file is not located in \$CGNROOT/tables/matrix, specify the full path as the value of the -matrix parameter.

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-trans=<transtab\_name> Translation table. The default location for the table is \$CGNROOT/tables/trans.

-onestrand Restricts the search to just the top strand of the query/database nucleic sequence.

-list=<n> The maximum size of the output hit list. The default is 50.

-docalign=<n> The number of documentation lines preceding each alignment. The default is 10.

-thr\_score=<score\_name> The score that places limits on the display of results. Scores that are smaller than -thr\_min value or larger than -thr\_max value are not shown. Valid options are: quality, zscore, escore.

-thr\_max=<n> The score upper threshold. Results that are larger than -thr\_max value are not shown.

-thr\_min=<n> The score lower threshold. Results that are lower than -thr\_min value are not shown.

-align=<n> The number of alignments reported in the output file.

-noalign Do not display alignment.

Note: “-align” and “-noalign” parameters are mutually exclusive.

-outfmt=<format\_name> Specifies the output format type. The default format is PFS.

Possible values are:

- PFS—PFS text format
- FASTA—FASTA text format
- BLAST—BLAST text format

-nonorm Do not perform score normalization.

-norm=<norm\_name> Specifies the normalization method. Valid options are:

- log—logarithm normalization.
- std—standard normalization.
- stat—Pearson statistical method.

Note: “-nonorm” and “-norm” parameters cannot be used together.

Note: Parameters -xgapop, -xgapext, -fgapop, -fgapext, -ygapop, -ygapext, -delop, and -delext apply only to FRAME+.

-xgapop=<n> The penalty for opening a gap when inserting a codon (triplet). The default is 12.0.

-xgapext=<n> The penalty for extending a gap when inserting a codon (triplet). The default is 4.0.

-ygapop=<n> The penalty for opening a gap when deleting an amino acid. The default is 12.0.

-ygapext=<n> The penalty for extending a gap when deleting an amino acid. The default is 4.0.

-fgapop=<n> The penalty for opening a gap when inserting a DNA base. The default is 6.0.

-fgapext=<n> The penalty for extending a gap when inserting a DNA base. The default is 7.0.

-delop=<n> The penalty for opening a gap when deleting a DNA base. The default is 6.0.

-delext=<n> The penalty for extending a gap when deleting a DNA base. The default is 7.0.

-silent No screen output is produced.

-host=<host\_name> The name of the host on which the server runs. By default, the application uses the host specified in the file \$CGNROOT/cgnhosts.

-wait Do not go to the background when the device is busy. This option is not relevant for the Parseq or Soft pseudo device.

-batch Run the job in the background. When this option is specified, the file “\$CGNROOT/defaults/batch.defaults” is used for choosing the batch command. If this file does not exist, the command “at now” is used to run the job.

Note: “-batch” and “-wait” parameters are mutually exclusive.

-version Prints the software version number.

-help Displays this help message. To get more specific help type: “om -model=<model\_fname>-help”.

According to some embodiments the homology is a local homology or a local identity.

Local alignments tools include, but are not limited to the BlastP, BlastN, BlastX or TBLASTN software of the National Center of Biotechnology Information (NCBI), FASTA, and the Smith-Waterman algorithm.

A tblastn search allows the comparison between a protein sequence to the six-frame translations of a nucleotide database. It can be a very productive way of finding homologous protein coding regions in unannotated nucleotide sequences such as expressed sequence tags (ESTs) and draft genome records (HTG), located in the BLAST databases est and htgs, respectively.

Default parameters for blastp include: Max target sequences: 100; Expected threshold:  $e^{-5}$ ; Word size: 3; Max matches in a query range: 0; Scoring parameters: Matrix—BLOSUM62; filters and masking: Filter—low complexity regions.

Local alignments tools, which can be used include, but are not limited to, the tBLASTX algorithm, which compares the six-frame conceptual translation products of a nucleotide query sequence (both strands) against a protein sequence database. Default parameters include: Max target sequences: 100; Expected threshold: 10; Word size: 3; Max matches in a query range: 0; Scoring parameters: Matrix—BLOSUM62; filters and masking: Filter—low complexity regions.

According to some embodiments of the invention, the exogenous polynucleotide of the invention encodes a polypeptide having an amino acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% identical to the amino acid sequence selected from the group consisting of SEQ ID NOs:496-794, 2898-3645, 3647-4854 and 4855.

According to some embodiments of the invention, the exogenous polynucleotide of the invention encodes a polypeptide having the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to some embodiments of the invention, the method of increasing fertilizer use efficiency, nitrogen use efficiency, yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant, is effected by expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide at least at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% identical to the amino acid sequence selected from the group consisting of SEQ ID NOs:496-794, 2898-3645, 3647-4854 and 4855, thereby increasing the fertilizer use efficiency, nitrogen use efficiency, yield, biomass, growth

rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity and/or abiotic stress tolerance of the plant.

According to some embodiments of the invention, the exogenous polynucleotide encodes a polypeptide consisting of the amino acid sequence set forth by SEQ ID NO:496-794, 2898-4854 or 4855.

According to an aspect of some embodiments of the invention, the method of increasing fertilizer use efficiency, nitrogen use efficiency, yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant is effected by expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide comprising an amino acid sequence selected from the group consisting of SEQ ID NOs:496-794, 2898-4854 and 4855, thereby increasing the fertilizer use efficiency, nitrogen use efficiency, yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the plant.

According to an aspect of some embodiments of the invention, there is provided a method of increasing fertilizer use efficiency, nitrogen use efficiency, yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant, comprising expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855, thereby increasing the fertilizer use efficiency, nitrogen use efficiency, yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the plant.

According to some embodiments of the invention, the exogenous polynucleotide encodes a polypeptide consisting of the amino acid sequence set forth by SEQ ID NO: 496-794, 2898-4854 or 4855.

According to some embodiments of the invention the exogenous polynucleotide comprises a nucleic acid sequence which is at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

According to an aspect of some embodiments of the invention, there is provided a method of increasing fertilizer use efficiency, nitrogen use efficiency, yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant, comprising expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897, thereby increasing the fertilizer use

efficiency, nitrogen use efficiency, yield, biomass, growth rate, vigor, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the plant.

According to some embodiments of the invention the exogenous polynucleotide is at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the polynucleotide selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

According to some embodiments of the invention the exogenous polynucleotide is set forth by SEQ ID NO: 1-495, 795-2896 or 2897.

According to some embodiments of the invention the method of increasing fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a plant further comprising selecting a plant having an increased fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to the wild type plant of the same species which is grown under the same growth conditions.

It should be noted that selecting a transformed plant having an increased trait as compared to a native (or non-transformed) plant grown under the same growth conditions is performed by selecting for the trait, e.g., validating the ability of the transformed plant to exhibit the increased trait using well known assays (e.g., seedling analyses, greenhouse assays) as is further described herein below.

According to an aspect of some embodiments of the invention, there is provided a method of selecting a transformed plant having increased fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to a wild type plant of the same species which is grown under the same growth conditions, the method comprising:

(a) providing plants transformed with an exogenous polynucleotide encoding a polypeptide comprising an amino acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% homologous (e.g., having sequence similarity or sequence identity) to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855,

(b) selecting from said plants a plant having increased fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance,

thereby selecting the plant having increased fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality,

fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to the wild type plant of the same species which is grown under the same growth conditions.

According to an aspect of some embodiments of the invention, there is provided a method of selecting a transformed plant having increased fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to a wild type plant of the same species which is grown under the same growth conditions, the method comprising:

(a) providing plants transformed with an exogenous polynucleotide encoding a polypeptide comprising an amino acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897,

(b) selecting from said plants a plant having increased fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance,

thereby selecting the plant having increased fertilizer use efficiency, nitrogen use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance as compared to the wild type plant of the same species which is grown under the same growth conditions.

As used herein the term "polynucleotide" refers to a single or double stranded nucleic acid sequence which is isolated and provided in the form of an RNA sequence, a complementary polynucleotide sequence (cDNA), a genomic polynucleotide sequence and/or a composite polynucleotide sequences (e.g., a combination of the above).

The term "isolated" refers to at least partially separated from the natural environment e.g., from a plant cell.

As used herein the phrase "complementary polynucleotide sequence" refers to a sequence, which results from reverse transcription of messenger RNA using a reverse transcriptase or any other RNA dependent DNA polymerase. Such a sequence can be subsequently amplified in vivo or in vitro using a DNA dependent DNA polymerase.

As used herein the phrase "genomic polynucleotide sequence" refers to a sequence derived (isolated) from a chromosome and thus it represents a contiguous portion of a chromosome.

As used herein the phrase "composite polynucleotide sequence" refers to a sequence, which is at least partially complementary and at least partially genomic. A composite sequence can include some exonal sequences required to encode the polypeptide of the present invention, as well as some intronic sequences interposing therebetween. The intronic sequences can be of any source, including of other genes, and typically will include conserved splicing signal sequences. Such intronic sequences may further include cis acting expression regulatory elements.

Nucleic acid sequences encoding the polypeptides of the present invention may be optimized for expression. Examples of such sequence modifications include, but are not limited to, an altered G/C content to more closely

approach that typically found in the plant species of interest, and the removal of codons atypically found in the plant species commonly referred to as codon optimization.

The phrase "codon optimization" refers to the selection of appropriate DNA nucleotides for use within a structural gene or fragment thereof that approaches codon usage within the plant of interest. Therefore, an optimized gene or nucleic acid sequence refers to a gene in which the nucleotide sequence of a native or naturally occurring gene has been modified in order to utilize statistically-preferred or statistically-favored codons within the plant. The nucleotide sequence typically is examined at the DNA level and the coding region optimized for expression in the plant species determined using any suitable procedure, for example as described in Sardana et al. (1996, *Plant Cell Reports* 15:677-681). In this method, the standard deviation of codon usage, a measure of codon usage bias, may be calculated by first finding the squared proportional deviation of usage of each codon of the native gene relative to that of highly expressed plant genes, followed by a calculation of the average squared deviation. The formula used is:  $1 \text{ SDCU} = \frac{1}{N} \sum [(X_n - Y_n) / Y_n]^2 / N$ , where  $X_n$  refers to the frequency of usage of codon  $n$  in highly expressed plant genes, where  $Y_n$  to the frequency of usage of codon  $n$  in the gene of interest and  $N$  refers to the total number of codons in the gene of interest. A Table of codon usage from highly expressed genes of dicotyledonous plants is compiled using the data of Murray et al. (1989, *Nuc Acids Res.* 17:477-498).

One method of optimizing the nucleic acid sequence in accordance with the preferred codon usage for a particular plant cell type is based on the direct use, without performing any extra statistical calculations, of codon optimization Tables such as those provided on-line at the Codon Usage Database through the NIAS (National Institute of Agrobiological Sciences) DNA bank in Japan (kazusa (dot) or (dot) jp/codon/). The Codon Usage Database contains codon usage tables for a number of different species, with each codon usage Table having been statistically determined based on the data present in Genbank.

By using the above Tables to determine the most preferred or most favored codons for each amino acid in a particular species (for example, rice), a naturally-occurring nucleotide sequence encoding a protein of interest can be codon optimized for that particular plant species. This is effected by replacing codons that may have a low statistical incidence in the particular species genome with corresponding codons, in regard to an amino acid, that are statistically more favored. However, one or more less-favored codons may be selected to delete existing restriction sites, to create new ones at potentially useful junctions (5' and 3' ends to add signal peptide or termination cassettes, internal sites that might be used to cut and splice segments together to produce a correct full-length sequence), or to eliminate nucleotide sequences that may negatively effect mRNA stability or expression.

The naturally-occurring encoding nucleotide sequence may already, in advance of any modification, contain a number of codons that correspond to a statistically-favored codon in a particular plant species. Therefore, codon optimization of the native nucleotide sequence may comprise determining which codons, within the native nucleotide sequence, are not statistically-favored with regards to a particular plant, and modifying these codons in accordance with a codon usage table of the particular plant to produce a codon optimized derivative. A modified nucleotide sequence may be fully or partially optimized for plant codon usage provided that the protein encoded by the modified nucleotide sequence is produced at a level higher than the

protein encoded by the corresponding naturally occurring or native gene. Construction of synthetic genes by altering the codon usage is described in for example PCT Patent Application 93/07278.

According to some embodiments of the invention, the exogenous polynucleotide is a non-coding RNA.

As used herein the phrase "non-coding RNA" refers to an RNA molecule which does not encode an amino acid sequence (a polypeptide). Examples of such non-coding RNA molecules include, but are not limited to, an antisense RNA, a pre-miRNA (precursor of a microRNA), or a precursor of a Piwi-interacting RNA (piRNA).

Non-limiting examples of non-coding RNA polynucleotides are provided in SEQ ID NOs: 217, 218, 219, 287, 288, 495, 997, 1003, 1543 and 1703.

Thus, the invention encompasses nucleic acid sequences described hereinabove; fragments thereof, sequences hybridizable therewith, sequences homologous thereto, sequences encoding similar polypeptides with different codon usage, altered sequences characterized by mutations, such as deletion, insertion or substitution of one or more nucleotides, either naturally occurring or man induced, either randomly or in a targeted fashion.

According to some embodiments of the invention, the exogenous polynucleotide encodes a polypeptide comprising an amino acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the amino acid sequence of a naturally occurring plant orthologue of the polypeptide selected from the group consisting of SEQ ID NOs: 496-794, and 2898-4855.

According to some embodiments of the invention, the polypeptide comprising an amino acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the amino acid sequence of a naturally occurring plant orthologue of the polypeptide selected from the group consisting of SEQ ID NOs: 496-794, and 2898-4855.

The invention provides an isolated polynucleotide comprising a nucleic acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the polynucleotide selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

According to some embodiments of the invention the nucleic acid sequence is capable of increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, abiotic stress tolerance and/or water use efficiency of a plant.

According to some embodiments of the invention the isolated polynucleotide comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

According to some embodiments of the invention the isolated polynucleotide is set forth by SEQ ID NO: 1-495, 795-2896 or 2897.

The invention provides an isolated polynucleotide comprising a nucleic acid sequence encoding a polypeptide which comprises an amino acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% homologous to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855.

According to some embodiments of the invention the amino acid sequence is capable of increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, photosynthetic capacity, abiotic stress tolerance and/or water use efficiency of a plant.

The invention provides an isolated polynucleotide comprising a nucleic acid sequence encoding a polypeptide which comprises the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to an aspect of some embodiments of the invention, there is provided a nucleic acid construct comprising the isolated polynucleotide of the invention, and a promoter for directing transcription of the nucleic acid sequence in a host cell.

The invention provides an isolated polypeptide comprising an amino acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% homologous to an amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855.

According to some embodiments of the invention, the polypeptide comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to some embodiments of the invention, the polypeptide is set forth by SEQ ID NO: 496-794, 2898-4854 or 4855.

The invention also encompasses fragments of the above described polypeptides and polypeptides having mutations, such as deletions, insertions or substitutions of one or more amino acids, either naturally occurring or man induced, either randomly or in a targeted fashion.

The term "plant" as used herein encompasses a whole plant, a grafted plant, ancestor(s) and progeny of the plants and plant parts, including seeds, shoots, stems, roots (including tubers), rootstock, scion, and plant cells, tissues and organs. The plant may be in any form including suspension cultures, embryos, meristematic regions, callus tissue, leaves, gametophytes, sporophytes, pollen, and microspores. Plants that are particularly useful in the methods of the

invention include all plants which belong to the superfamily Viridiplantae, in particular monocotyledonous and dicotyledonous plants including a fodder or forage legume, ornamental plant, food crop, tree, or shrub selected from the list comprising *Acacia* spp., *Acer* spp., *Actinidia* spp., *Aesculus* spp., *Agathis australis*, *Albizia amara*, *Alsophila tricolor*, *Andropogon* spp., *Arachis* spp., *Areca catechu*, *Astelia fragrans*, *Astragalus cicer*, *Baikiaea plurijuga*, *Betula* spp., *Brassica* spp., *Bruguiera gymnorrhiza*, *Burkea africana*, *Butea frondosa*, *Cadaba farinosa*, *Calliandra* spp., *Camellia sinensis*, *Canna indica*, *Capsicum* spp., *Cassia* spp., *Centroema pubescens*, *Chacoomeles* spp., *Cinnamomum cassia*, *Coffea arabica*, *Colophospermum mopane*, *Coronilla varia*, *Cotoneaster serotina*, *Crataegus* spp., *Cucumis* spp., *Cupressus* spp., *Cyathea dealbata*, *Cydonia oblonga*, *Cryptomeria japonica*, *Cymbopogon* spp., *Cynthea dealbata*, *Cydonia oblonga*, *Dalbergia monetaria*, *Davallia divaricata*, *Desmodium* spp., *Dicksonia squarrosa*, *Dibeteropogon amplexans*, *Dioclea* spp., *Dolichos* spp., *Dorycnium rectum*, *Echinochloa pyramidalis*, *Ehrafia* spp., *Eleusine coracana*, *Eragrostis* spp., *Erythrina* spp., *Eucalyptus* spp., *Euclea schimperii*, *Eulalia villosa*, *Pagopyrum* spp., *Feijoa sellowiana*, *Fragaria* spp., *Flemingia* spp., *Freycinetia banksii*, *Geranium thunbergii*, *Ginkgo biloba*, *Glycine javanica*, *Gliricidia* spp., *Gossypium hirsutum*, *Grevillea* spp., *Gubourtia coleosperma*, *Hedysarum* spp., *Hemaphysa altissima*, *Heteropogon contortus*, *Hordeum vulgare*, *Hyparrhenia rufa*, *Hypericum erectum*, *Hypophylla dissoluta*, *Indigo incamata*, *Iris* spp., *Leptarrhena pyrolifolia*, *Lespedeza* spp., *Lettuca* spp., *Leucaena leucocephala*, *Loudetia simplex*, *Lotonus bainesii*, *Lotus* spp., *Macrotyloma axillare*, *Malus* spp., *Manihot esculenta*, *Medicago sativa*, *Metasequoia glyptostroboides*, *Musa sapientum*, *Nicotianum* spp., *Onobrychis* spp., *Ornithopus* spp., *Oryza* spp., *Peltophorum africanum*, *Pennisetum* spp., *Persea gratissima*, *Petunia* spp., *Phaseolus* spp., *Phoenix canariensis*, *Phormium cookianum*, *Photinia* spp., *Picea glauca*, *Pinus* spp., *Pisum sativum*, *Podocarpus totara*, *Pogonarthria fleckii*, *Pogonaffhria squarrosa*, *Populus* spp., *Prosopis cineraria*, *Pseudotsuga menziesii*, *Pterolobium stellatum*, *Pyrus communis*, *Quercus* spp., *Rhaphiolepis umbellata*, *Rhopalostylis sapida*, *Rhus natalensis*, *Ribes grossularia*, *Ribes* spp., *Robinia pseudoacacia*, *Rosa* spp., *Rubus* spp., *Salix* spp., *Schyzachyrium sanguineum*, *Sciadopitys veficillata*, *Sequoia sempervirens*, *Sequoiadendron giganteum*, *Sorghum bicolor*, *Spinacia* spp., *Sporobolus fimbriatus*, *Stiburus alopecuroides*, *Stylosanthos humilis*, *Tadehagi* spp., *Taxodium distichum*, *Themeda triandra*, *Trifolium* spp., *Triticum* spp., *Tsuga heterophylla*, *Vaccinium* spp., *Vicia* spp., *Vitis vinifera*, *Watsonia pyramidalis*, *Zantedeschia aethiopica*, *Zea mays*, amaranth, artichoke, asparagus, broccoli, Brussels sprouts, cabbage, canola, carrot, cauliflower, celery, collard greens, flax, kale, lentil, oilseed rape, okra, onion, potato, rice, soybean, straw, sugar beet, sugar cane, sunflower, tomato, squash tea, maize, wheat, barley, rye, oat, peanut, pea, lentil and alfalfa, cotton, rapeseed, canola, pepper, sunflower, tobacco, eggplant, *eucalyptus*, a tree, an ornamental plant, a perennial grass and a forage crop. Alternatively algae and other non-Viridiplantae can be used for the methods of the present invention.

According to some embodiments of the invention, the plant used by the method of the invention is a crop plant such as rice, maize, wheat, barley, peanut, potato, sesame, olive tree, palm oil, banana, soybean, sunflower, canola, sugarcane, alfalfa, millet, leguminosae (bean, pea), flax, *lupinus*, rapeseed, tobacco, poplar and cotton.

According to some embodiments of the invention the plant is a dicotyledonous plant.

According to some embodiments of the invention the plant is a monocotyledonous plant.

According to some embodiments of the invention, there is provided a plant cell exogenously expressing the polynucleotide of some embodiments of the invention, the nucleic acid construct of some embodiments of the invention and/or the polypeptide of some embodiments of the invention.

According to some embodiments of the invention, expressing the exogenous polynucleotide of the invention within the plant is effected by transforming one or more cells of the plant with the exogenous polynucleotide, followed by generating a mature plant from the transformed cells and cultivating the mature plant under conditions suitable for expressing the exogenous polynucleotide within the mature plant.

According to some embodiments of the invention, the transformation is effected by introducing to the plant cell a nucleic acid construct which includes the exogenous polynucleotide of some embodiments of the invention and at least one promoter for directing transcription of the exogenous polynucleotide in a host cell (a plant cell). Further details of suitable transformation approaches are provided hereinbelow.

As mentioned, the nucleic acid construct according to some embodiments of the invention comprises a promoter sequence and the isolated polynucleotide of some embodiments of the invention.

According to some embodiments of the invention, the isolated polynucleotide is operably linked to the promoter sequence.

A coding nucleic acid sequence is "operably linked" to a regulatory sequence (e.g., promoter) if the regulatory sequence is capable of exerting a regulatory effect on the coding sequence linked thereto.

As used herein, the term "promoter" refers to a region of DNA which lies upstream of the transcriptional initiation site of a gene to which RNA polymerase binds to initiate transcription of RNA. The promoter controls where (e.g., which portion of a plant) and/or when (e.g., at which stage or condition in the lifetime of an organism) the gene is expressed.

According to some embodiments of the invention, the promoter is heterologous to the isolated polynucleotide and/or to the host cell.

As used herein the phrase "heterologous promoter" refers to a promoter from a different species or from the same species but from a different gene locus as of the isolated polynucleotide sequence.

According to some embodiments of the invention, the isolated polynucleotide is heterologous to the plant cell.

Any suitable promoter sequence can be used by the nucleic acid construct of the present invention. Preferably the promoter is a constitutive promoter, a tissue-specific, or an abiotic stress-inducible promoter.

According to some embodiments of the invention, the promoter is a plant promoter, which is suitable for expression of the exogenous polynucleotide in a plant cell.

Suitable promoters for expression in wheat include, but are not limited to, Wheat SPA promoter (SEQ ID NO: 4856; Albanietal, Plant Cell, 9: 171-184, 1997, which is fully incorporated herein by reference), wheat LMW (SEQ ID NO: 4857 (longer LMW promoter), and SEQ ID NO: 4858 (LMW promoter) and HMW glutenin-1 (SEQ ID NO: 4859 (Wheat HMW glutenin-1 longer promoter); and SEQ ID NO: 4860 (Wheat HMW glutenin-1 Promoter); Thomas and Flavell, The Plant Cell 2:1171-1180; Furtado et al., 2009 Plant Biotechnology Journal 7:240-253, each of which is

fully incorporated herein by reference), wheat alpha, beta and gamma gliadins [e.g., SEQ ID NO: 4861 (wheat alpha gliadin, B genome, promoter); SEQ ID NO: 4862 (wheat gamma gliadin promoter); EMBO 3:1409-15, 1984, which is fully incorporated herein by reference], wheat TdPR60 [SEQ ID NO: 4863 (wheat TdPR60 longer promoter) or SEQ ID NO: 4864 (wheat TdPR60 promoter); Kovalchuk et al., Plant Mol Biol 71:81-98, 2009, which is fully incorporated herein by reference], maize Ub1 Promoter [cultivar Nongda 105 (SEQ ID NO: 4865); GenBank: DQ141598.1; Taylor et al., Plant Cell Rep 1993 12: 491-495, which is fully incorporated herein by reference; and cultivar B73 (SEQ ID NO: 4866); Christensen, A H, et al. Plant Mol. Biol. 18 (4), 675-689 (1992), which is fully incorporated herein by reference]; rice actin 1 (SEQ ID NO: 4867; Mc Elroy et al. 1990, The Plant Cell, Vol. 2, 163-171, which is fully incorporated herein by reference), rice GOS2 [SEQ ID NO: 4868 (rice GOS2 longer promoter) and SEQ ID NO: 4869 (rice GOS2 Promoter); De Pater et al. Plant J. 1992; 2: 837-44, which is fully incorporated herein by reference], *arabidopsis* Pho1 [SEQ ID NO: 4870 (*arabidopsis* Pho1 Promoter); Hamburger et al., Plant Cell. 2002; 14: 889-902, which is fully incorporated herein by reference], ExpansinB promoters, e.g., rice ExpB5 [SEQ ID NO: 4871 (rice ExpB5 longer promoter) and SEQ ID NO: 4872 (rice ExpB5 promoter)] and Barley ExpB1 [SEQ ID NO: 4873 (barley ExpB1 Promoter), Won et al. Mol Cells. 2010; 30:369-76, which is fully incorporated herein by reference], barley SS2 (sucrose synthase 2) [(SEQ ID NO: 4874), Guerin and Carbonero, *Plant Physiology May* 1997 vol. 114 no. 1 55-62, which is fully incorporated herein by reference], and rice PG5a [SEQ ID NO: 4875, U.S. Pat. No. 7,700,835, Nakase et al., Plant Mol Biol. 32:621-30, 1996, each of which is fully incorporated herein by reference].

Suitable constitutive promoters include, for example, CaMV 35S promoter [SEQ ID NO: 4876 (CaMV 35S (QFNC) Promoter); SEQ ID NO: 4877 (PJJ 35S from *Brachypodium*); SEQ ID NO: 4878 (CaMV 35S (OLD) Promoter) (Odell et al., Nature 313:810-812, 1985)], *Arabidopsis* At6669 promoter (SEQ ID NO: 4879 (*Arabidopsis* At6669 (OLD) Promoter); see PCT Publication No. W004081173A2 or the new At6669 promoter (SEQ ID NO: 4880 (*Arabidopsis* At6669 (NEW) Promoter)); maize Ub1 Promoter [cultivar Nongda 105 (SEQ ID NO: 4865); GenBank: DQ141598.1; Taylor et al., Plant Cell Rep 1993 12: 491-495, which is fully incorporated herein by reference; and cultivar B73 (SEQ ID NO: 4866); Christensen, A H, et al. Plant Mol. Biol. 18 (4), 675-689 (1992), which is fully incorporated herein by reference]; rice actin 1 (SEQ ID NO: 4867, McElroy et al., Plant Cell 2:163-171, 1990); pEMU (Last et al., Theor. Appl. Genet. 81:581-588, 1991); CaMV 19S (Nilsson et al., Physiol. Plant 100:456-462, 1997); rice GOS2 [SEQ ID NO: 4868 (rice GOS2 longer Promoter) and SEQ ID NO: 4869 (rice GOS2 Promoter), de Pater et al, Plant J November; 2(6):837-44, 1992]; RBCS promoter (SEQ ID NO: 4881); Rice cyclophilin (Bucholz et al, Plant Mol Biol. 25(5):837-43, 1994); Maize H3 histone (Lepetit et al, Mol. Gen. Genet. 231: 276-285, 1992); Actin 2 (An et al, Plant J. 10(1); 107-121, 1996) and Synthetic Super MAS (Ni et al., The Plant Journal 7: 661-76, 1995). Other constitutive promoters include those in U.S. Pat. Nos. 5,659,026, 5,608, 149; 5,608,144; 5,604,121; 5,569,597; 5,466,785; 5,399, 680; 5,268,463; and 5,608,142.

Suitable tissue-specific promoters include, but not limited to, leaf-specific promoters [e.g., AT5G06690 (Thioredoxin) (high expression, SEQ ID NO: 4882), AT5G61520 (AT-STP3) (low expression, SEQ ID NO: 4883) described in

Buttner et al 2000 Plant, Cell and Environment 23, 175-184, or the promoters described in Yamamoto et al., Plant J. 12:255-265, 1997; Kwon et al., Plant Physiol. 105:357-67, 1994; Yamamoto et al., Plant Cell Physiol. 35:773-778, 1994; Gotor et al., Plant J. 3:509-18, 1993; Orozco et al., Plant Mol. Biol. 23:1129-1138, 1993; and Matsuoka et al., Proc. Natl. Acad. Sci. USA 90:9586-9590, 1993; as well as *Arabidopsis* STP3 (AT5G61520) promoter (Buttner et al., Plant, Cell and Environment 23:175-184, 2000)], seed-preferred promoters [e.g., Napin (originated from *Brassica napus* which is characterized by a seed specific promoter activity; Stuitje A. R. et. al. Plant Biotechnology Journal 1 (4): 301-309; SEQ ID NO: 4884 (*Brassica napus* NAPIN Promoter) from seed specific genes (Simon, et al., Plant Mol. Biol. 5. 191, 1985; Scofield, et al., J. Biol. Chem. 262: 12202, 1987; Baszczynski, et al., Plant Mol. Biol. 14: 633, 1990), rice PG5a (SEQ ID NO: 4875; U.S. Pat. No. 7,700, 835), early seed development *Arabidopsis* BAN (AT1G61720) (SEQ ID NO: 4885, US 2009/0031450 A1), late seed development *Arabidopsis* ABI3 (AT3G24650) (SEQ ID NO: 4886 (*Arabidopsis* ABI3 (AT3G24650) longer Promoter) or 4887 (*Arabidopsis* ABI3 (AT3G24650) Promoter)) (Ng et al., Plant Molecular Biology 54: 25-38, 2004), Brazil Nut albumin (Pearson' et al., Plant Mol. Biol. 18: 235-245, 1992), legumin (Ellis, et al. Plant Mol. Biol. 10: 203-214, 1988), Glutelin (rice) (Takaiwa, et al., Mol. Gen. Genet. 208: 15-22, 1986; Takaiwa, et al., FEBS Letts. 221: 43-47, 1987), Zein (Matzke et al Plant Mol Biol. 143). 323-32 1990), napA (Stalberg, et al, Planta 199: 515-519, 1996), Wheat SPA (SEQ ID NO:4856; Albanietal, Plant Cell, 9: 171-184, 1997), sunflower oleosin (Cummins, et al., Plant Mol. Biol. 19: 873-876, 1992)], endosperm specific promoters [e.g., wheat LMW (SEQ ID NO: 4857 (Wheat LMW Longer Promoter), and SEQ ID NO: 4858 (Wheat LMW Promoter) and HMW glutenin-1 [(SEQ ID NO: 4859 (Wheat HMW glutenin-1 longer Promoter)); and SEQ ID NO: 4860 (Wheat HMW glutenin-1 Promoter), Thomas and Flavell, The Plant Cell 2:1171-1180, 1990; Mol Gen Genet 216:81-90, 1989; NAR 17:461-2), wheat alpha, beta and gamma gliadins (SEQ ID NO: 4861 (wheat alpha gliadin (B genome) promoter); SEQ ID NO: 4862 (wheat gamma gliadin promoter); EMBO 3:1409-15, 1984), Barley 1tr1 promoter, barley B1, C, D hordein (Theor Appl Gen 98:1253-62, 1999; Plant J 4:343-55, 1993; Mol Gen Genet 250:750-60, 1996), Barley DOF (Mena et al, The Plant Journal, 116(1): 53-62, 1998), Biz2 (EP99106056.7), Barley SS2 (SEQ ID NO: 4874 (Barley SS2 Promoter); Guerin and Carbonero Plant Physiology 114: 1 55-62, 1997), wheat Tarp60 (Kovalchuk et al., Plant Mol Biol 71:81-98, 2009), barley D-hordein (D-Hor) and B-hordein (B-Hor) (Agnelo Furtado, Robert J. Henry and Alessandro Pellegrineschi (2009)], Synthetic promoter (Vicente-Carbajosa et al., Plant J. 13: 629-640, 1998), rice prolamin NRP33, rice-globulin Glb-1 (Wu et al, Plant Cell Physiology 39(8) 885-889, 1998), rice alpha-globulin REB/OHP-1 (Nakase et al. Plant Mol. Biol. 33: 513-S22, 1997), rice ADP-glucose PP (Trans Res 6:157-68, 1997), maize ESR gene family (Plant J 12:235-46, 1997), sorghum gamma-kafrin (PMB 32:1029-35, 1996)], embryo specific promoters [e.g., rice OSH1 (Sato et al, Proc. Natl. Acad. Sci. USA, 93: 8117-8122), KNOX (Postma-Haarsma et al, Plant Mol. Biol. 39:257-71, 1999), rice oleosin (Wu et at, J. Biochem., 123:386, 1998)], and flower-specific promoters [e.g., AtPRP4, chalcone synthase (chsA) (Van der Meer, et al., Plant Mol. Biol. 15, 95-109, 1990), LAT52 (Twell et al Mol. Gen Genet. 217: 240-245; 1989), *Arabidopsis* *apetala*-3 (Tilly et al., Development. 125:1647-57, 1998), *Arabidopsis* *APETALA* 1

(AT1G69120, AP1) (SEQ ID NO: 4888 (*Arabidopsis* (AT1G69120) *APETALA* 1)) (Hempel et al., Development 124:3845-3853, 1997)], and root promoters [e.g., the ROOTP promoter [SEQ ID NO: 4889]; rice ExpB5 (SEQ ID NO:4872 (rice ExpB5 Promoter); or SEQ ID NO: 4871 (rice ExpB5 longer Promoter)) and barley ExpB1 promoters (SEQ ID NO:4873) (Won et al. Mol. Cells 30: 369-376, 2010); *arabidopsis* ATTPS-CIN (AT3G25820) promoter (SEQ ID NO: 4890; Chen et al., Plant Phys 135:1956-66, 2004); *arabidopsis* Pho1 promoter (SEQ ID NO: 4870, Hamburger et al., Plant Cell. 14: 889-902, 2002), which is also slightly induced by stress].

Suitable abiotic stress-inducible promoters include, but not limited to, salt-inducible promoters such as RD29A (Yamaguchi-Shinozalei et al., Mol. Gen. Genet. 236:331-340, 1993); drought-inducible promoters such as maize rab17 gene promoter (Pla et. al., Plant Mol. Biol. 21:259-266, 1993), maize rab28 gene promoter (Busk et. al., Plant J. 11:1285-1295, 1997) and maize Ivr2 gene promoter (Pelleschi et. al., Plant Mol. Biol. 39:373-380, 1999); heat-inducible promoters such as heat tomato hsp80-promoter from tomato (U.S. Pat. No. 5,187,267).

The nucleic acid construct of some embodiments of the invention can further include an appropriate selectable marker and/or an origin of replication. According to some embodiments of the invention, the nucleic acid construct utilized is a shuttle vector, which can propagate both in *E. coli* (wherein the construct comprises an appropriate selectable marker and origin of replication) and be compatible with propagation in cells. The construct according to the present invention can be, for example, a plasmid, a bacmid, a phagemid, a cosmid, a phage, a virus or an artificial chromosome.

The nucleic acid construct of some embodiments of the invention can be utilized to stably or transiently transform plant cells. In stable transformation, the exogenous polynucleotide is integrated into the plant genome and as such it represents a stable and inherited trait. In transient transformation, the exogenous polynucleotide is expressed by the cell transformed but it is not integrated into the genome and as such it represents a transient trait.

There are various methods of introducing foreign genes into both monocotyledonous and dicotyledonous plants (Potrykus, I., Annu. Rev. Plant. Physiol., Plant. Mol. Biol. (1991) 42:205-225; Shimamoto et al., Nature (1989) 338: 274-276).

The principle methods of causing stable integration of exogenous DNA into plant genomic DNA include two main approaches:

(i) *Agrobacterium*-mediated gene transfer: Klee et al. (1987) Annu. Rev. Plant Physiol. 38:467-486; Klee and Rogers in Cell Culture and Somatic Cell Genetics of Plants, Vol. 6, Molecular Biology of Plant Nuclear Genes, eds. Schell, J., and Vasil, L. K., Academic Publishers, San Diego, Calif. (1989) p. 2-25; Gatenby, in Plant Biotechnology, eds. Kung, S. and Arntzen, C. J., Butterworth Publishers, Boston, Mass. (1989) p. 93-112.

(ii) Direct DNA uptake: Paszkowski et al., in Cell Culture and Somatic Cell Genetics of Plants, Vol. 6, Molecular Biology of Plant Nuclear Genes eds. Schell, J., and Vasil, L. K., Academic Publishers, San Diego, Calif. (1989) p. 52-68; including methods for direct uptake of DNA into protoplasts, Toriyama, K. et al. (1988) Bio/Technology 6:1072-1074. DNA uptake induced by brief electric shock of plant cells: Zhang et al. Plant Cell Rep. (1988) 7:379-384. Fromm et al. Nature (1986) 319:791-793. DNA injection into plant cells or tissues by particle bombardment, Klein et al. Bio/

Technology (1988) 6:559-563; McCabe et al. Bio/Technology (1988) 6:923-926; Sanford, Physiol. Plant. (1990) 79:206-209; by the use of micropipette systems: Neuhaus et al., Theor. Appl. Genet. (1987) 75:30-36; Neuhaus and Spangenberg, Physiol. Plant. (1990) 79:213-217; glass fibers or silicon carbide whisker transformation of cell cultures, embryos or callus tissue, U.S. Pat. No. 5,464,765 or by the direct incubation of DNA with germinating pollen, DeWet et al. in Experimental Manipulation of Ovule Tissue, eds. Chapman, G. P. and Mantell, S. H. and Daniels, W. Longman, London, (1985) p. 197-209; and Ohta, Proc. Natl. Acad. Sci. USA (1986) 83:715-719.

The *Agrobacterium* system includes the use of plasmid vectors that contain defined DNA segments that integrate into the plant genomic DNA. Methods of inoculation of the plant tissue vary depending upon the plant species and the *Agrobacterium* delivery system. A widely used approach is the leaf disc procedure which can be performed with any tissue explant that provides a good source for initiation of whole plant differentiation. See, e.g., Horsch et al. in Plant Molecular Biology Manual AS, Kluwer Academic Publishers, Dordrecht (1988) p. 1-9. A supplementary approach employs the *Agrobacterium* delivery system in combination with vacuum infiltration. The *Agrobacterium* system is especially viable in the creation of transgenic dicotyledonous plants.

There are various methods of direct DNA transfer into plant cells. In electroporation, the protoplasts are briefly exposed to a strong electric field. In microinjection, the DNA is mechanically injected directly into the cells using very small micropipettes. In microparticle bombardment, the DNA is adsorbed on microprojectiles such as magnesium sulfate crystals or tungsten particles, and the microprojectiles are physically accelerated into cells or plant tissues.

Following stable transformation plant propagation is exercised. The most common method of plant propagation is by seed. Regeneration by seed propagation, however, has the deficiency that due to heterozygosity there is a lack of uniformity in the crop, since seeds are produced by plants according to the genetic variances governed by Mendelian rules. Basically, each seed is genetically different and each will grow with its own specific traits. Therefore, it is preferred that the transformed plant be produced such that the regenerated plant has the identical traits and characteristics of the parent transgenic plant. Therefore, it is preferred that the transformed plant be regenerated by micropopagation which provides a rapid, consistent reproduction of the transformed plants.

Micropropagation is a process of growing new generation plants from a single piece of tissue that has been excised from a selected parent plant or cultivar. This process permits the mass reproduction of plants having the preferred tissue expressing the fusion protein. The new generation plants which are produced are genetically identical to, and have all of the characteristics of, the original plant. Micropropagation allows mass production of quality plant material in a short period of time and offers a rapid multiplication of selected cultivars in the preservation of the characteristics of the original transgenic or transformed plant. The advantages of cloning plants are the speed of plant multiplication and the quality and uniformity of plants produced.

Micropropagation is a multi-stage procedure that requires alteration of culture medium or growth conditions between stages. Thus, the micropropagation process involves four basic stages: Stage one, initial tissue culturing; stage two, tissue culture multiplication; stage three, differentiation and plant formation; and stage four, greenhouse culturing and

hardening. During stage one, initial tissue culturing, the tissue culture is established and certified contaminant-free. During stage two, the initial tissue culture is multiplied until a sufficient number of tissue samples are produced from the seedlings to meet production goals. During stage three, the tissue samples grown in stage two are divided and grown into individual plantlets. At stage four, the transformed plantlets are transferred to a greenhouse for hardening where the plants' tolerance to light is gradually increased so that it can be grown in the natural environment.

According to some embodiments of the invention, the transgenic plants are generated by transient transformation of leaf cells, meristematic cells or the whole plant.

Transient transformation can be effected by any of the direct DNA transfer methods described above or by viral infection using modified plant viruses.

Viruses that have been shown to be useful for the transformation of plant hosts include CaMV, Tobacco mosaic virus (TMV), brome mosaic virus (BMV) and Bean Common Mosaic Virus (BV or BCMV). Transformation of plants using plant viruses is described in U.S. Pat. No. 4,855,237 (bean golden mosaic virus; BGV), EP-A 67,553 (TMV), Japanese Published Application No. 63-14693 (TMV), EPA 194,809 (BV), EPA 278,667 (BV); and Gluzman, Y. et al., Communications in Molecular Biology: Viral Vectors, Cold Spring Harbor Laboratory, New York, pp. 172-189 (1988). Pseudovirus particles for use in expressing foreign DNA in many hosts, including plants are described in WO 87/06261.

According to some embodiments of the invention, the virus used for transient transformations is avirulent and thus is incapable of causing severe symptoms such as reduced growth rate, mosaic, ring spots, leaf roll, yellowing, streaking, pox formation, tumor formation and pitting. A suitable avirulent virus may be a naturally occurring avirulent virus or an artificially attenuated virus. Virus attenuation may be effected by using methods well known in the art including, but not limited to, sub-lethal heating, chemical treatment or by directed mutagenesis techniques such as described, for example, by Kurihara and Watanabe (Molecular Plant Pathology 4:259-269, 2003), Gal-on et al. (1992), Atreya et al. (1992) and Huet et al. (1994).

Suitable virus strains can be obtained from available sources such as, for example, the American Type culture Collection (ATCC) or by isolation from infected plants. Isolation of viruses from infected plant tissues can be effected by techniques well known in the art such as described, for example by Foster and Taylor, Eds. "Plant Virology Protocols: From Virus Isolation to Transgenic Resistance (Methods in Molecular Biology (Humana Pr), Vol 81)", Humana Press, 1998. Briefly, tissues of an infected plant believed to contain a high concentration of a suitable virus, preferably young leaves and flower petals, are ground in a buffer solution (e.g., phosphate buffer solution) to produce a virus infected sap which can be used in subsequent inoculations.

Construction of plant RNA viruses for the introduction and expression of non-viral exogenous polynucleotide sequences in plants is demonstrated by the above references as well as by Dawson, W. O. et al., Virology (1989) 172:285-292; Takamatsu et al. EMBO J. (1987) 6:307-311; French et al. Science (1986) 231:1294-1297; Takamatsu et al. FEBS Letters (1990) 269:73-76; and U.S. Pat. No. 5,316,931.

When the virus is a DNA virus, suitable modifications can be made to the virus itself. Alternatively, the virus can first be cloned into a bacterial plasmid for ease of constructing the desired viral vector with the foreign DNA. The virus can

then be excised from the plasmid. If the virus is a DNA virus, a bacterial origin of replication can be attached to the viral DNA, which is then replicated by the bacteria. Transcription and translation of this DNA will produce the coat protein which will encapsidate the viral DNA. If the virus is an RNA virus, the virus is generally cloned as a cDNA and inserted into a plasmid. The plasmid is then used to make all of the constructions. The RNA virus is then produced by transcribing the viral sequence of the plasmid and translation of the viral genes to produce the coat protein(s) which encapsidate the viral RNA.

In one embodiment, a plant viral polynucleotide is provided in which the native coat protein coding sequence has been deleted from a viral polynucleotide, a non-native plant viral coat protein coding sequence and a non-native promoter, preferably the subgenomic promoter of the non-native coat protein coding sequence, capable of expression in the plant host, packaging of the recombinant plant viral polynucleotide, and ensuring a systemic infection of the host by the recombinant plant viral polynucleotide, has been inserted. Alternatively, the coat protein gene may be inactivated by insertion of the non-native polynucleotide sequence within it, such that a protein is produced. The recombinant plant viral polynucleotide may contain one or more additional non-native subgenomic promoters. Each non-native subgenomic promoter is capable of transcribing or expressing adjacent genes or polynucleotide sequences in the plant host and incapable of recombination with each other and with native subgenomic promoters. Non-native (foreign) polynucleotide sequences may be inserted adjacent the native plant viral subgenomic promoter or the native and a non-native plant viral subgenomic promoters if more than one polynucleotide sequence is included. The non-native polynucleotide sequences are transcribed or expressed in the host plant under control of the subgenomic promoter to produce the desired products.

In a second embodiment, a recombinant plant viral polynucleotide is provided as in the first embodiment except that the native coat protein coding sequence is placed adjacent one of the non-native coat protein subgenomic promoters instead of a non-native coat protein coding sequence.

In a third embodiment, a recombinant plant viral polynucleotide is provided in which the native coat protein gene is adjacent its subgenomic promoter and one or more non-native subgenomic promoters have been inserted into the viral polynucleotide. The inserted non-native subgenomic promoters are capable of transcribing or expressing adjacent genes in a plant host and are incapable of recombination with each other and with native subgenomic promoters. Non-native polynucleotide sequences may be inserted adjacent the non-native subgenomic plant viral promoters such that the sequences are transcribed or expressed in the host plant under control of the subgenomic promoters to produce the desired product.

In a fourth embodiment, a recombinant plant viral polynucleotide is provided as in the third embodiment except that the native coat protein coding sequence is replaced by a non-native coat protein coding sequence.

The viral vectors are encapsidated by the coat proteins encoded by the recombinant plant viral polynucleotide to produce a recombinant plant virus. The recombinant plant viral polynucleotide or recombinant plant virus is used to infect appropriate host plants. The recombinant plant viral polynucleotide is capable of replication in the host, systemic spread in the host, and transcription or expression of foreign gene(s) (exogenous polynucleotide) in the host to produce the desired protein.

Techniques for inoculation of viruses to plants may be found in Foster and Taylor, eds. "Plant Virology Protocols: From Virus Isolation to Transgenic Resistance (Methods in Molecular Biology (Humana Pr), Vol 81)", Humana Press, 1998; Maramorosh and Koprowski, eds. "Methods in Virology" 7 vols, Academic Press, New York 1967-1984; Hill, S. A. "Methods in Plant Virology", Blackwell, Oxford, 1984; Walkey, D. G. A. "Applied Plant Virology", Wiley, New York, 1985; and Kado and Agrawa, eds. "Principles and Techniques in Plant Virology", Van Nostrand-Reinhold, New York.

In addition to the above, the polynucleotide of the present invention can also be introduced into a chloroplast genome thereby enabling chloroplast expression.

A technique for introducing exogenous polynucleotide sequences to the genome of the chloroplasts is known. This technique involves the following procedures. First, plant cells are chemically treated so as to reduce the number of chloroplasts per cell to about one. Then, the exogenous polynucleotide is introduced via particle bombardment into the cells with the aim of introducing at least one exogenous polynucleotide molecule into the chloroplasts. The exogenous polynucleotides selected such that it is integratable into the chloroplast's genome via homologous recombination which is readily effected by enzymes inherent to the chloroplast. To this end, the exogenous polynucleotide includes, in addition to a gene of interest, at least one polynucleotide stretch which is derived from the chloroplast's genome. In addition, the exogenous polynucleotide includes a selectable marker, which serves by sequential selection procedures to ascertain that all or substantially all of the copies of the chloroplast genomes following such selection will include the exogenous polynucleotide. Further details relating to this technique are found in U.S. Pat. Nos. 4,945,050; and 5,693,507 which are incorporated herein by reference. A polypeptide can thus be produced by the protein expression system of the chloroplast and become integrated into the chloroplast's inner membrane.

According to some embodiments, there is provided a method of improving nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of a grafted plant, the method comprising providing a scion that does not transgenically express a polynucleotide encoding a polypeptide at least 80% homologous to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, and 2898-4855 and a plant rootstock that transgenically expresses a polynucleotide encoding a polypeptide at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% homologous (or identical) to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855 (e.g., in a constitutive or an abiotic stress responsive manner), thereby improving the nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance of the grafted plant.

In some embodiments, the plant scion is non-transgenic. Several embodiments relate to a grafted plant exhibiting improved nitrogen use efficiency, fertilizer use efficiency,

yield, growth rate, biomass, vigor, oil content, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, and/or abiotic stress tolerance, comprising a scion that does not transgenically express a polynucleotide encoding a polypeptide at least 80% homologous to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794 and 2898-4855 and a plant rootstock that transgenically expresses a polynucleotide encoding a polypeptide at least at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% homologous (or identical) to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855.

In some embodiments, the plant root stock transgenically expresses a polynucleotide encoding a polypeptide at least at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% homologous (or identical) to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855 in a stress responsive manner.

According to some embodiments of the invention, the plant root stock transgenically expresses a polynucleotide encoding a polypeptide selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to some embodiments of the invention, the plant root stock transgenically expresses a polynucleotide comprising a nucleic acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the polynucleotide selected from the group consisting of SEQ ID NOs: 1-495, and 795-2897.

According to some embodiments of the invention, the plant root stock transgenically expresses a polynucleotide selected from the group consisting of SEQ ID NOs: 1-495, and 795-2897.

Since processes which increase nitrogen use efficiency, fertilizer use efficiency, oil content, yield, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, growth rate, biomass, vigor and/or abiotic stress tolerance of a plant can involve multiple genes acting additively or in synergy (see, for example, in Quesda et al., *Plant Physiol.* 130:951-063, 2002), the present invention also envisages expressing a plurality of exogenous polynucleotides in a single host plant to thereby achieve superior effect on nitrogen use efficiency, fertilizer use efficiency, oil content, yield, seed yield, fiber yield, fiber quality, fiber length, photosynthetic capacity, growth rate, biomass, vigor and/or abiotic stress tolerance.

Expressing a plurality of exogenous polynucleotides in a single host plant can be effected by co-introducing multiple nucleic acid constructs, each including a different exogenous

polynucleotide, into a single plant cell. The transformed cell can then be regenerated into a mature plant using the methods described hereinabove.

Alternatively, expressing a plurality of exogenous polynucleotides in a single host plant can be effected by co-introducing into a single plant-cell a single nucleic-acid construct including a plurality of different exogenous polynucleotides. Such a construct can be designed with a single promoter sequence which can transcribe a polycistronic messenger RNA including all the different exogenous polynucleotide sequences. To enable co-translation of the different polypeptides encoded by the polycistronic messenger RNA, the polynucleotide sequences can be inter-linked via an internal ribosome entry site (IRES) sequence which facilitates translation of polynucleotide sequences positioned downstream of the IRES sequence. In this case, a transcribed polycistronic RNA molecule encoding the different polypeptides described above will be translated from both the capped 5' end and the two internal IRES sequences of the polycistronic RNA molecule to thereby produce in the cell all different polypeptides. Alternatively, the construct can include several promoter sequences each linked to a different exogenous polynucleotide sequence.

The plant cell transformed with the construct including a plurality of different exogenous polynucleotides, can be regenerated into a mature plant, using the methods described hereinabove.

Alternatively, expressing a plurality of exogenous polynucleotides in a single host plant can be effected by introducing different nucleic acid constructs, including different exogenous polynucleotides, into a plurality of plants. The regenerated transformed plants can then be cross-bred and resultant progeny selected for superior abiotic stress tolerance, water use efficiency, fertilizer use efficiency, growth, biomass, yield and/or vigor traits, using conventional plant breeding techniques.

According to some embodiments of the invention, the method further comprising growing the plant expressing the exogenous polynucleotide under the abiotic stress.

Non-limiting examples of abiotic stress conditions include, salinity, osmotic stress, drought, water deprivation, excess of water (e.g., flood, waterlogging), etiolation, low temperature (e.g., cold stress), high temperature, heavy metal toxicity, anaerobiosis, nutrient deficiency (e.g., nitrogen deficiency or nitrogen limitation), nutrient excess, atmospheric pollution and UV irradiation.

According to some embodiments of the invention, the method further comprising growing the plant expressing the exogenous polynucleotide under fertilizer limiting conditions (e.g., nitrogen-limiting conditions). Non-limiting examples include growing the plant on soils with low nitrogen content (40-50% Nitrogen of the content present under normal or optimal conditions), or even under severe nitrogen deficiency (0-10% Nitrogen of the content present under normal or optimal conditions).

Thus, the invention encompasses plants exogenously expressing the polynucleotide(s), the nucleic acid constructs and/or polypeptide(s) of the invention.

Once expressed within the plant cell or the entire plant, the level of the polypeptide encoded by the exogenous polynucleotide can be determined by methods well known in the art such as, activity assays, Western blots using antibodies capable of specifically binding the polypeptide, Enzyme-Linked Immuno Sorbent Assay (ELISA), radio-immunoassays (RIA), immunohistochemistry, immunocytochemistry, immunofluorescence and the like.

Methods of determining the level in the plant of the RNA transcribed from the exogenous polynucleotide are well known in the art and include, for example, Northern blot analysis, reverse transcription polymerase chain reaction (RT-PCR) analysis (including quantitative, semi-quantitative or real-time RT-PCR) and RNA-in situ hybridization.

The sequence information and annotations uncovered by the present teachings can be harnessed in favor of classical breeding. Thus, sub-sequence data of those polynucleotides described above, can be used as markers for marker assisted selection (MAS), in which a marker is used for indirect selection of a genetic determinant or determinants of a trait of interest (e.g., biomass, growth rate, oil content, yield, abiotic stress tolerance, water use efficiency, nitrogen use efficiency and/or fertilizer use efficiency). Nucleic acid data of the present teachings (DNA or RNA sequence) may contain or be linked to polymorphic sites or genetic markers on the genome such as restriction fragment length polymorphism (RFLP), microsatellites and single nucleotide polymorphism (SNP), DNA fingerprinting (DFP), amplified fragment length polymorphism (AFLP), expression level polymorphism, polymorphism of the encoded polypeptide and any other polymorphism at the DNA or RNA sequence.

Examples of marker assisted selections include, but are not limited to, selection for a morphological trait (e.g., a gene that affects form, coloration, male sterility or resistance such as the presence or absence of awn, leaf sheath coloration, height, grain color, aroma of rice); selection for a biochemical trait (e.g., a gene that encodes a protein that can be extracted and observed; for example, isozymes and storage proteins); selection for a biological trait (e.g., pathogen races or insect biotypes based on host pathogen or host parasite interaction can be used as a marker since the genetic constitution of an organism can affect its susceptibility to pathogens or parasites).

The polynucleotides and polypeptides described hereinabove can be used in a wide range of economical plants, in a safe and cost effective manner.

Plant lines exogenously expressing the polynucleotide or the polypeptide of the invention are screened to identify those that show the greatest increase of the desired plant trait.

Thus, according to an additional embodiment of the present invention, there is provided a method of evaluating a trait of a plant, the method comprising: (a) expressing in a plant or a portion thereof the nucleic acid construct of some embodiments of the invention; and (b) evaluating a trait of a plant as compared to a wild type plant of the same type (e.g., a plant not transformed with the claimed biomolecules); thereby evaluating the trait of the plant.

According to an aspect of some embodiments of the invention there is provided a method of producing a crop comprising growing a crop of a plant expressing an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% homologous (e.g., identical) to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855, wherein said plant is derived from a plant selected for increased fertilizer use efficiency, increased nitrogen use efficiency, increased abiotic stress tolerance, increased water

use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, and/or increased photosynthetic capacity as compared to a control plant, thereby producing the crop.

According to an aspect of some embodiments of the present invention there is provided a method of producing a crop comprising growing a crop plant transformed with an exogenous polynucleotide encoding a polypeptide at least 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% homologous (e.g., identical) to the amino acid sequence selected from the group consisting of SEQ ID NOs: 496-794, 2898-3645, 3647-4854 and 4855, wherein the crop plant is derived from plants selected for increased abiotic stress tolerance, increased water use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased fertilizer use efficiency (e.g., increased nitrogen use efficiency) as compared to a wild type plant of the same species which is grown under the same growth conditions, and the crop plant having the increased abiotic stress tolerance, increased water use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased fertilizer use efficiency (e.g., increased nitrogen use efficiency), thereby producing the crop.

According to some embodiments of the invention the polypeptide is selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to an aspect of some embodiments of the invention there is provided a method of producing a crop comprising growing a crop of a plant expressing an exogenous polynucleotide which comprises a nucleic acid sequence which is at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897, wherein said plant is derived from a plant (parent plant) that has been transformed to express the exogenous polynucleotide and that has been selected for increased abiotic stress tolerance, increased water use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased fertilizer use efficiency (e.g., increased nitrogen use efficiency) as compared to a control plant, thereby producing the crop.

According to an aspect of some embodiments of the present invention there is provided a method of producing a crop comprising growing a crop plant transformed with an exogenous polynucleotide at least 80%, at least about 81%,

at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, or more say 100% identical to the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897, wherein the crop plant is derived from plants selected for increased abiotic stress tolerance, increased water use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased fertilizer use efficiency (e.g., increased nitrogen use efficiency) as compared to a wild type plant of the same species which is grown under the same growth conditions, and the crop plant having the increased abiotic stress tolerance, increased water use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased fertilizer use efficiency (e.g., increased nitrogen use efficiency), thereby producing the crop.

According to some embodiments of the invention the exogenous polynucleotide is selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

According to an aspect of some embodiments of the invention there is provided a method of growing a crop comprising seeding seeds and/or planting plantlets of a plant transformed with the exogenous polynucleotide of the invention, e.g., the polynucleotide which encodes the polypeptide of some embodiments of the invention, wherein the plant is derived from plants selected for at least one trait selected from the group consisting of increased abiotic stress tolerance, increased water use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased fertilizer use efficiency (e.g., increased nitrogen use efficiency) as compared to a non-transformed plant.

According to some embodiments of the invention the method of growing a crop comprising seeding seeds and/or planting plantlets of a plant transformed with an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to SEQ ID NO: 496-794, 2898-3645, 3647-4854 or 4855, wherein the plant is derived from plants selected for at least one trait selected from the group consisting of increased abiotic stress tolerance, increased water use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased fertilizer use efficiency (e.g., increased nitrogen use efficiency) as compared to a non-transformed plant, thereby growing the crop.

According to some embodiments of the invention the polypeptide is selected from the group consisting of SEQ ID NOs: 496-794, 2898-4854 and 4855.

According to some embodiments of the invention the method of growing a crop comprising seeding seeds and/or planting plantlets of a plant transformed with an exogenous polynucleotide comprising the nucleic acid sequence at least about 80%, at least about 81%, at least about 82%, at least about 83%, at least about 84%, at least about 85%, at least about 86%, at least about 87%, at least about 88%, at least about 89%, at least about 90%, at least about 91%, at least about 92%, at least about 93%, at least about 93%, at least about 94%, at least about 95%, at least about 96%, at least about 97%, at least about 98%, at least about 99%, e.g., 100% identical to SEQ ID NO: 1-495, 795-2896 or 2897, wherein the plant is derived from plants selected for at least one trait selected from the group consisting of increased abiotic stress tolerance, increased water use efficiency, increased growth rate, increased vigor, increased biomass, increased oil content, increased yield, increased seed yield, increased fiber yield, increased fiber quality, increased fiber length, increased photosynthetic capacity, and/or increased fertilizer use efficiency (e.g., increased nitrogen use efficiency) as compared to a non-transformed plant, thereby growing the crop.

According to some embodiments of the invention the exogenous polynucleotide is selected from the group consisting of SEQ ID NOs: 1-495, 795-2896 and 2897.

The effect of the transgene (the exogenous polynucleotide encoding the polypeptide) on abiotic stress tolerance can be determined using known methods such as detailed below and in the Examples section which follows.

Abiotic stress tolerance—Transformed (i.e., expressing the transgene) and non-transformed (wild type) plants are exposed to an abiotic stress condition, such as water deprivation, suboptimal temperature (low temperature, high temperature), nutrient deficiency, nutrient excess, a salt stress condition, osmotic stress, heavy metal toxicity, anaerobiosis, atmospheric pollution and UV irradiation.

Salinity tolerance assay—Transgenic plants with tolerance to high salt concentrations are expected to exhibit better germination, seedling vigor or growth in high salt. Salt stress can be effected in many ways such as, for example, by irrigating the plants with a hyperosmotic solution, by cultivating the plants hydroponically in a hyperosmotic growth solution (e.g., Hoagland solution), or by culturing the plants in a hyperosmotic growth medium [e.g., 50% Murashige-Skoog medium (MS medium)]. Since different plants vary considerably in their tolerance to salinity, the salt concentration in the irrigation water, growth solution, or growth medium can be adjusted according to the specific characteristics of the specific plant cultivar or variety, so as to inflict a mild or moderate effect on the physiology and/or morphology of the plants (for guidelines as to appropriate concentration see, Bernstein and Kafafi, Root Growth Under Salinity Stress In: Plant Roots, The Hidden Half 3rd ed. Waisel Y, Eshel A and Kafafi U. (editors) Marcel Dekker Inc., New York, 2002, and reference therein).

For example, a salinity tolerance test can be performed by irrigating plants at different developmental stages with increasing concentrations of sodium chloride (for example 50 mM, 100 mM, 200 mM, 400 mM NaCl) applied from the bottom and from above to ensure even dispersal of salt. Following exposure to the stress condition the plants are frequently monitored until substantial physiological and/or morphological effects appear in wild type plants. Thus, the

external phenotypic appearance, degree of wilting and overall success to reach maturity and yield progeny are compared between control and transgenic plants.

Quantitative parameters of tolerance measured include, but are not limited to, the average wet and dry weight, growth rate, leaf size, leaf coverage (overall leaf area), the weight of the seeds yielded, the average seed size and the number of seeds produced per plant. Transformed plants not exhibiting substantial physiological and/or morphological effects, or exhibiting higher biomass than wild-type plants, are identified as abiotic stress tolerant plants.

Osmotic tolerance test—Osmotic stress assays (including sodium chloride and mannitol assays) are conducted to determine if an osmotic stress phenotype was sodium chloride-specific or if it was a general osmotic stress related phenotype. Plants which are tolerant to osmotic stress may have more tolerance to drought and/or freezing. For salt and osmotic stress germination experiments, the medium is supplemented for example with 50 mM, 100 mM, 200 mM NaCl or 100 mM, 200 mM NaCl, 400 mM mannitol.

Drought tolerance assay/Osmotic assay—Tolerance to drought is performed to identify the genes conferring better plant survival after acute water deprivation. To analyze whether the transgenic plants are more tolerant to drought, an osmotic stress produced by the non-ionic osmolyte sorbitol in the medium can be performed. Control and transgenic plants are germinated and grown in plant-agar plates for 4 days, after which they are transferred to plates containing 500 mM sorbitol. The treatment causes growth retardation, then both control and transgenic plants are compared, by measuring plant weight (wet and dry), yield, and by growth rates measured as time to flowering.

Conversely, soil-based drought screens are performed with plants overexpressing the polynucleotides detailed above. Seeds from control *Arabidopsis* plants, or other transgenic plants overexpressing the polypeptide of the invention are germinated and transferred to pots. Drought stress is obtained after irrigation is ceased accompanied by placing the pots on absorbent paper to enhance the soil-drying rate. Transgenic and control plants are compared to each other when the majority of the control plants develop severe wilting. Plants are re-watered after obtaining a significant fraction of the control plants displaying a severe wilting. Plants are ranked comparing to controls for each of two criteria: tolerance to the drought conditions and recovery (survival) following re-watering.

Cold stress tolerance—To analyze cold stress, mature (25 day old) plants are transferred to 4° C. chambers for 1 or 2 weeks, with constitutive light. Later on plants are moved back to greenhouse. Two weeks later damages from chilling period, resulting in growth retardation and other phenotypes, are compared between both control and transgenic plants, by measuring plant weight (wet and dry), and by comparing growth rates measured as time to flowering, plant size, yield, and the like.

Heat stress tolerance—Heat stress tolerance is achieved by exposing the plants to temperatures above 34° C. for a certain period. Plant tolerance is examined after transferring the plants back to 22° C. for recovery and evaluation after 5 days relative to internal controls (non-transgenic plants) or plants not exposed to neither cold or heat stress.

Water use efficiency—can be determined as the biomass produced per unit transpiration. To analyze WUE, leaf relative water content can be measured in control and transgenic plants. Fresh weight (FW) is immediately recorded; then leaves are soaked for 8 hours in distilled water at room temperature in the dark, and the turgid weight

(TW) is recorded. Total dry weight (DW) is recorded after drying the leaves at 60° C. to a constant weight. Relative water content (RWC) is calculated according to the following Formula 1:

$$\text{RWC} = [(FW - DW) / (TW - DW)] \times 100$$

Formula 1

Fertilizer use efficiency—To analyze whether the transgenic plants are more responsive to fertilizers, plants are grown in agar plates or pots with a limited amount of fertilizer, as described, for example, in Examples 15-17 hereinbelow and in Yanagisawa et al (Proc Natl Acad Sci USA. 2004; 101:7833-8). The plants are analyzed for their overall size, time to flowering, yield, protein content of shoot and/or grain. The parameters checked are the overall size of the mature plant, its wet and dry weight, the weight of the seeds yielded, the average seed size and the number of seeds produced per plant. Other parameters that may be tested are: the chlorophyll content of leaves (as nitrogen plant status and the degree of leaf verdure is highly correlated), amino acid and the total protein content of the seeds or other plant parts such as leaves or shoots, oil content, etc. Similarly, instead of providing nitrogen at limiting amounts, phosphate or potassium can be added at increasing concentrations. Again, the same parameters measured are the same as listed above. In this way, nitrogen use efficiency (NUE), phosphate use efficiency (PUE) and potassium use efficiency (KUE) are assessed, checking the ability of the transgenic plants to thrive under nutrient restraining conditions.

Nitrogen use efficiency—To analyze whether the transgenic plants (e.g., *Arabidopsis* plants) are more responsive to nitrogen, plant are grown in 0.75-3 mM (nitrogen deficient conditions) or 6-10 mM (optimal nitrogen concentration). Plants are allowed to grow for additional 25 days or until seed production. The plants are then analyzed for their overall size, time to flowering, yield, protein content of shoot and/or grain/seed production. The parameters checked can be the overall size of the plant, wet and dry weight, the weight of the seeds yielded, the average seed size and the number of seeds produced per plant. Other parameters that may be tested are: the chlorophyll content of leaves (as nitrogen plant status and the degree of leaf greenness is highly correlated), amino acid and the total protein content of the seeds or other plant parts such as leaves or shoots and oil content. Transformed plants not exhibiting substantial physiological and/or morphological effects, or exhibiting higher measured parameters levels than wild-type plants, are identified as nitrogen use efficient plants.

Nitrogen use efficiency assay using plantlets—The assay is done according to Yanagisawa-S. et al. with minor modifications ("Metabolic engineering with Dof1 transcription factor in plants: Improved nitrogen assimilation and growth under low-nitrogen conditions" *Proc. Natl. Acad. Sci. USA* 101, 7833-7838). Briefly, transgenic plants which are grown for 7-10 days in 0.5×MS [Murashige-Skoog] supplemented with a selection agent are transferred to two nitrogen-limiting conditions: MS media in which the combined nitrogen concentration (NH<sub>4</sub>NO<sub>3</sub> and KNO<sub>3</sub>) was 0.75 mM (nitrogen deficient conditions) or 6-15 mM (optimal nitrogen concentration). Plants are allowed to grow for additional 30-40 days and then photographed, individually removed from the Agar (the shoot without the roots) and immediately weighed (fresh weight) for later statistical analysis. Constructs for which only T1 seeds are available are sown on selective media and at least 20 seedlings (each one representing an independent transformation event) are carefully transferred to the nitrogen-limiting media. For constructs for which T2 seeds are available, different transformation events

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are analyzed. Usually, 20 randomly selected plants from each event are transferred to the nitrogen-limiting media allowed to grow for 3-4 additional weeks and individually weighed at the end of that period. Transgenic plants are compared to control plants grown in parallel under the same conditions. Mock—transgenic plants expressing the uidA reporter gene (GUS) under the same promoter or transgenic plants carrying the same promoter but lacking a reporter gene are used as control.

Nitrogen determination—The procedure for N (nitrogen) concentration determination in the structural parts of the plants involves the potassium persulfate digestion method to convert organic N to  $\text{NO}_3^-$  (Purcell and King 1996 Argon. J. 88:111-113, the modified  $\text{Cd}^{2+}$  mediated reduction of  $\text{NO}_3^-$  to  $\text{NO}_2^-$  (Vodovotz 1996 Biotechniques 20:390-394) and the measurement of nitrite by the Griess assay (Vodovotz 1996, supra). The absorbance values are measured at 550 nm against a standard curve of  $\text{NaNO}_2$ . The procedure is described in details in Samonte et al. 2006 Agron. J. 98:168-176.

Germination tests—Germination tests compare the percentage of seeds from transgenic plants that could complete the germination process to the percentage of seeds from control plants that are treated in the same manner. Normal conditions are considered for example, incubations at 22° C. under 22-hour light 2-hour dark daily cycles. Evaluation of germination and seedling vigor is conducted between 4 and 14 days after planting. The basal media is 50% MS medium (Murashige and Skoog, 1962 Plant Physiology 15, 473-497).

Germination is checked also at unfavorable conditions such as cold (incubating at temperatures lower than 10° C. instead of 22° C.) or using seed inhibition solutions that contain high concentrations of an osmolyte such as sorbitol (at concentrations of 50 mM, 100 mM, 200 mM, 300 mM, 500 mM, and up to 1000 mM) or applying increasing concentrations of salt (of 50 mM, 100 mM, 200 mM, 300 mM, 500 mM NaCl).

The effect of the transgene on plant's vigor, growth rate, biomass, yield and/or oil content can be determined using known methods.

Plant vigor—The plant vigor can be calculated by the increase in growth parameters such as leaf area, fiber length, rosette diameter, plant fresh weight and the like per time.

Growth rate—The growth rate can be measured using digital analysis of growing plants. For example, images of plants growing in greenhouse on plot basis can be captured every 3 days and the rosette area can be calculated by digital analysis. Rosette area growth is calculated using the difference of rosette area between days of sampling divided by the difference in days between samples.

Evaluation of growth rate can be done by measuring plant biomass produced, rosette area, leaf size or root length per time (can be measured in  $\text{cm}^2$  per day of leaf area).

Relative growth area can be calculated using Formula II.

$$\text{Relative growth rate area} = \text{Regression coefficient of area along time course} \quad \text{Formula II}$$

Thus, the relative growth area rate is in units of area units (e.g.,  $\text{mm}^2/\text{day}$  or  $\text{cm}^2/\text{day}$ ) and the relative length growth rate is in units of length units (e.g.,  $\text{cm}/\text{day}$  or  $\text{mm}/\text{day}$ ).

For example, RGR can be determined for plant height (Formula III), SPAD (Formula IV), Number of tillers (Formula V), root length (Formula VI), vegetative growth (Formula VII), leaf number (Formula VIII), rosette area (Formula IX), rosette diameter (Formula X), plot coverage (Formula XI), leaf blade area (Formula XII), and leaf area (Formula XIII).

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Relative growth rate of Plant height=Regression coefficient of Plant height along time course (measured in  $\text{cm}/\text{day}$ ). Formula III

Relative growth rate of SPAD=Regression coefficient of SPAD measurements along time course. Formula IV

Relative growth rate of Number of tillers=Regression coefficient of Number of tillers along time course(measured in units of "number of tillers/day"). Formula V

Relative growth rate of root length=Regression coefficient of root length along time course(measured in  $\text{cm}$  per day). Formula VI

Vegetative growth rate analysis—was calculated according to Formula VII below.

Relative growth rate of vegetative growth=Regression coefficient of vegetative weight along time course(measured in grams per day). Formula VII

Relative growth rate of leaf number=Regression coefficient of leaf number along time course (measured in number per day). Formula VIII

Relative growth rate of rosette area=Regression coefficient of rosette area along time course (measured in  $\text{cm}^2$  per day). Formula IX

Relative growth rate of rosette diameter=Regression coefficient of rosette diameter along time course (measured in  $\text{cm}$  per day). Formula X

Relative growth rate of plot coverage=Regression coefficient of plot(measured in  $\text{cm}^2$  per day). Formula XI

Relative growth rate of leaf blade area=Regression coefficient of leaf area along time course(measured in  $\text{cm}^2$  per day). Formula XII

Relative growth rate of leaf area=Regression coefficient of leaf area along time course(measured in  $\text{cm}^2$  per day). Formula XIII

1000 Seed Weight=number of seed in sample/sample weight $\times$ 1000 Formula XIV

The Harvest Index can be calculated using Formulas XV, XVI, XVII, XVIII and XXXVII below.

Harvest Index(seed)=Average seed yield per plant/Average dry weight. Formula XV

Harvest Index(*Sorghum*)=Average grain dry weight per Head/(Average vegetative dry weight per Head+Average Head dry weight) Formula XVI

Harvest Index(Maize)=Average grain weight per plant/(Average vegetative dry weight per plant plus Average grain weight per plant) Formula XVII

Harvest Index (for barley)—The harvest index is calculated using Formula XVIII.

Harvest Index(for barley and wheat)=Average spike dry weight per plant/(Average vegetative dry weight per plant+Average spike dry weight per plant). Formula XVIII

Following is a non-limited list of additional parameters which can be detected in order to show the effect of the transgene on the desired plant's traits:

Grain circularity= $4 \times 3.14 (\text{grain area}/\text{perimeter}^2)$  Formula XIX

internode volume= $3.14 \times (d/2)^2 \times l$  Formula XX

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|                                                                                                                                                                                        |                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Normalized ear weight per plant+vegetative dry weight.                                                                                                                                 | Formula XXI     |
| Root/Shoot Ratio=total weight of the root at harvest/total weight of the vegetative portion above ground at harvest.(=RBiH/BiH)                                                        | Formula XXII    |
| Ratio of the number of pods per node on main stem at pod set=Total number of pods on main stem/Total number of nodes on main stem.                                                     | Formula XXIII   |
| Ratio of total number of seeds in main stem to number of seeds on lateral branches=Total number of seeds on main stem at pod set/Total number of seeds on lateral branches at pod set. | Formula XXIV    |
| Petiole Relative Area=(Petiole area)/Rosette area (measured in %).                                                                                                                     | Formula XXV     |
| % reproductive tiller percentage=Number of Reproductive tillers/number of tillers)×100.                                                                                                | Formula XXVI    |
| Spikes Index=Average Spikes weight per plant/(Average vegetative dry weight per plant plus Average Spikes weight per plant).                                                           | Formula XXVII   |
| Relative growth rate of root coverage=Regression coefficient of root coverage along time course.                                                                                       | Formula XXVIII  |
| Seed Oil yield=Seed yield per plant (gr.)*Oil % in seed.                                                                                                                               | Formula XXIX    |
| shoot/root Ratio=total weight of the vegetative portion above ground at harvest/total weight of the root at harvest.                                                                   | Formula XXX     |
| Spikelets Index=Average Spikelets weight per plant/(Average vegetative dry weight per plant plus Average Spikelets weight per plant).                                                  | Formula XXXI    |
| % Canopy coverage=(1-(PAR_DOWN/PAR_UP))×100.                                                                                                                                           | Formula XXXII   |
| leaf mass fraction=Leaf area/shoot FW.                                                                                                                                                 | Formula XXXIII  |
| Relative growth rate based on dry weight=Regression coefficient of dry weight along time course.                                                                                       | Formula XXXIV   |
| Total dry matter(for Maize)=Normalized ear weight per plant+vegetative dry weight.                                                                                                     | Formula XXXV    |
| Agronomical <i>NUE</i> =                                                                                                                                                               | Formula XXXVI   |
| $\frac{\text{Yield per plant (Kg.)}^{\text{X Nitrogen Fertilization}} - \text{Yield per plant (Kg.)}^{0\% \text{ Nitrogen Fertilization}}}{\text{Fertilizer}^{\text{X}}}$              |                 |
| Harvest Index( <i>brachypodium</i> )=Average grain weight/average dry(vegetative+spikelet)weight per plant.                                                                            | Formula XXXVII  |
| Harvest Index for <i>Sorghum</i> *( <i>*</i> when the plants were not dried)=FW(fresh weight)Heads/(FW Heads+FW Plants)                                                                | Formula XXXVIII |
| Grain Fill Rate [mg/Day]—<br>Rate of dry matter accumulation in grain. The grain fill rate is calculated using Formula XXXIX                                                           |                 |
| $\text{Grain fill rate [mg/day]} = [\text{Grain weight*ear-1} \times 1000] / [\text{Grain number*ear-1} \times [\text{Grain filling duration}]]$                                       |                 |
| Grain protein concentration—Grain protein content (g grain protein m <sup>-2</sup> ) is estimated as the product of the mass of                                                        |                 |

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grain N (g grain N m<sup>-2</sup>) multiplied by the N/protein conversion ratio of k-5.13 (Mosse 1990, *supra*). The grain protein concentration is estimated as the ratio of grain protein content per unit mass of the grain (g grain protein kg<sup>-1</sup> grain).

Fiber length—Fiber length can be measured using fibrograph. The fibrograph system was used to compute length in terms of “Upper Half Mean” length. The upper half mean (UHM) is the average length of longer half of the fiber distribution. The fibrograph measures length in span lengths at a given percentage point (cottoninc (dot) com/ClassificationofCotton/?Pg=4#Length).

According to some embodiments of the invention, increased yield of corn may be manifested as one or more of the following: increase in the number of plants per growing area, increase in the number of ears per plant, increase in the number of rows per ear, number of kernels per ear row, kernel weight, thousand kernel weight (1000-weight), ear length/diameter, increase oil content per kernel and increase starch content per kernel.

As mentioned, the increase of plant yield can be determined by various parameters. For example, increased yield of rice may be manifested by an increase in one or more of the following: number of plants per growing area, number of panicles per plant, number of spikelets per panicle, number of flowers per panicle, increase in the seed filling rate, increase in thousand kernel weight (1000-weight), increase oil content per seed, increase starch content per seed, among others. An increase in yield may also result in modified architecture, or may occur because of modified architecture.

Similarly, increased yield of soybean may be manifested by an increase in one or more of the following: number of plants per growing area, number of pods per plant, number of seeds per pod, increase in the seed filling rate, increase in thousand seed weight (1000-weight), reduce pod shattering, increase oil content per seed, increase protein content per seed, among others. An increase in yield may also result in modified architecture, or may occur because of modified architecture.

Increased yield of canola may be manifested by an increase in one or more of the following: number of plants per growing area, number of pods per plant, number of seeds per pod, increase in the seed filling rate, increase in thousand seed weight (1000-weight), reduce pod shattering, increase oil content per seed, among others. An increase in yield may also result in modified architecture, or may occur because of modified architecture.

Increased yield of cotton may be manifested by an increase in one or more of the following: number of plants per growing area, number of bolls per plant, number of seeds per boll, increase in the seed filling rate, increase in thousand seed weight (1000-weight), increase oil content per seed, improve fiber length, fiber strength, among others. An increase in yield may also result in modified architecture, or may occur because of modified architecture.

Oil content—The oil content of a plant can be determined by extraction of the oil from the seed or the vegetative portion of the plant. Briefly, lipids (oil) can be removed from the plant (e.g., seed) by grinding the plant tissue in the presence of specific solvents (e.g., hexane or petroleum ether) and extracting the oil in a continuous extractor. Indirect oil content analysis can be carried out using various known methods such as Nuclear Magnetic Resonance (NMR) Spectroscopy, which measures the resonance energy absorbed by hydrogen atoms in the liquid state of the sample [See for example, Conway T F. and Earle E R., 1963, Journal of the American Oil Chemists’ Society; Springer Berlin/

Heidelberg, ISSN: 0003-021X (Print) 1558-9331 (Online)]; the Near Infrared (NI) Spectroscopy, which utilizes the absorption of near infrared energy (1100-2500 nm) by the sample; and a method described in WO/2001/023884, which is based on extracting oil a solvent, evaporating the solvent

Thus, the present invention is of high agricultural value for promoting the yield of commercially desired crops (e.g., biomass of vegetative organ such as poplar wood, or reproductive organ such as number of seeds or seed biomass).

Any of the transgenic plants described hereinabove or parts thereof may be processed to produce a feed, meal, protein or oil preparation, such as for ruminant animals.

The transgenic plants described hereinabove, which exhibit an increased oil content can be used to produce plant oil (by extracting the oil from the plant).

The plant oil (including the seed oil and/or the vegetative portion oil) produced according to the method of the invention may be combined with a variety of other ingredients. The specific ingredients included in a product are determined according to the intended use. Exemplary products include animal feed, raw material for chemical modification, biodegradable plastic, blended food product, edible oil, biofuel, cooking oil, lubricant, biodiesel, snack food, cosmetics, and fermentation process raw material. Exemplary products to be incorporated to the plant oil include animal feeds, human food products such as extruded snack foods, breads, as a food binding agent, aquaculture feeds, fermentable mixtures, food supplements, sport drinks, nutritional food bars, multi-vitamin supplements, diet drinks, and cereal foods.

According to some embodiments of the invention, the oil comprises a seed oil.

According to some embodiments of the invention, the oil comprises a vegetative portion oil (oil of the vegetative portion of the plant).

According to some embodiments of the invention, the plant cell forms a part of a plant.

According to another embodiment of the present invention, there is provided a food or feed comprising the plants or a portion thereof of the present invention.

As used herein the term "about" refers to  $\pm 10\%$ . The terms "comprises", "comprising", "includes", "including", "having" and their conjugates mean "including but not limited to".

The term "consisting of" means "including and limited to".

The term "consisting essentially of" means that the composition, method or structure may include additional ingredients, steps and/or parts, but only if the additional ingredients, steps and/or parts do not materially alter the basic and novel characteristics of the claimed composition, method or structure.

As used herein, the singular form "a", "an" and "the" include plural references unless the context clearly dictates otherwise. For example, the term "a compound" or "at least one compound" may include a plurality of compounds, including mixtures thereof.

Throughout this application, various embodiments of this invention may be presented in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the invention. Accordingly, the description of a range should be considered to have specifically disclosed all the possible subranges as well

as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed subranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

Whenever a numerical range is indicated herein, it is meant to include any cited numeral (fractional or integral) within the indicated range. The phrases "ranging/ranges between" a first indicate number and a second indicate number and "ranging/ranges from" a first indicate number "to" a second indicate number are used herein interchangeably and are meant to include the first and second indicated numbers and all the fractional and integral numerals therebetween.

As used herein the term "method" refers to manners, means, techniques and procedures for accomplishing a given task including, but not limited to, those manners, means, techniques and procedures either known to, or readily developed from known manners, means, techniques and procedures by practitioners of the chemical, pharmacological, biological, biochemical and medical arts.

When reference is made to particular sequence listings, such reference is to be understood to also encompass sequences that substantially correspond to its complementary sequence as including minor sequence variations, resulting from, e.g., sequencing errors, cloning errors, or other alterations resulting in base substitution, base deletion or base addition, provided that the frequency of such variations is less than 1 in 50 nucleotides, alternatively, less than 1 in 100 nucleotides, alternatively, less than 1 in 200 nucleotides, alternatively, less than 1 in 500 nucleotides, alternatively, less than 1 in 1000 nucleotides, alternatively, less than 1 in 5,000 nucleotides, alternatively, less than 1 in 10,000 nucleotides.

It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable subcombination or as suitable in any other described embodiment of the invention. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

Various embodiments and aspects of the present invention as delineated hereinabove and as claimed in the claims section below find experimental support in the following examples.

## EXAMPLES

Reference is now made to the following examples, which together with the above descriptions illustrate some embodiments of the invention in a non limiting fashion.

Generally, the nomenclature used herein and the laboratory procedures utilized in the present invention include molecular, biochemical, microbiological and recombinant DNA techniques. Such techniques are thoroughly explained in the literature. See, for example, "Molecular Cloning: A laboratory Manual" Sambrook et al., (1989); "Current Protocols in Molecular Biology" Volumes I-III Ausubel, R. M., ed. (1994); Ausubel et al., "Current Protocols in Molecular Biology", John Wiley and Sons, Baltimore, Md. (1989);

Perbal, "A Practical Guide to Molecular Cloning", John Wiley & Sons, New York (1988); Watson et al., "Recombinant DNA", Scientific American Books, New York; Birren et al. (eds) "Genome Analysis: A Laboratory Manual Series", Vols. 1-4, Cold Spring Harbor Laboratory Press, New York (1998); methodologies as set forth in U.S. Pat. Nos. 4,666,828; 4,683,202; 4,801,531; 5,192,659 and 5,272,057; "Cell Biology: A Laboratory Handbook", Volumes I-III Cellis, J. E., ed. (1994); "Current Protocols in Immunology" Volumes I-III Coligan J. E., ed. (1994); Stites et al. (eds), "Basic and Clinical Immunology" (8th Edition), Appleton & Lange, Norwalk, Conn. (1994); Mishell and Shiigi (eds), "Selected Methods in Cellular Immunology", W. H. Freeman and Co., New York (1980); available immunoassays are extensively described in the patent and scientific literature, see, for example, U.S. Pat. Nos. 3,791,932; 3,839,153; 3,850,752; 3,850,578; 3,853,987; 3,867,517; 3,879,262; 3,901,654; 3,935,074; 3,984,533; 3,996,345; 4,034,074; 4,098,876; 4,879,219; 5,011,771 and 5,281,521; "Oligonucleotide Synthesis" Gait, M. J., ed. (1984); "Nucleic Acid Hybridization" Hames, B. D., and Higgins S. J., eds. (1985); "Transcription and Translation" Hames, B. D., and Higgins S. J., Eds. (1984); "Animal Cell Culture" Freshney, R. I., ed. (1986); "Immobilized Cells and Enzymes" IRL Press, (1986); "A Practical Guide to Molecular Cloning" Perbal, B., (1984) and "Methods in Enzymology" Vol. 1-317, Academic Press; "PCR Protocols: A Guide To Methods And Applications", Academic Press, San Diego, Calif. (1990); Marshak et al., "Strategies for Protein Purification and Characterization—A Laboratory Course Manual" CSHL Press (1996); all of which are incorporated by reference as if fully set forth herein. Other general references are provided throughout this document. The procedures therein are believed to be well known in the art and are provided for the convenience of the reader. All the information contained therein is incorporated herein by reference.

#### General Experimental and Bioinformatics Methods

RNA extraction—Tissues growing at various growth conditions (as described below) were sampled and RNA was extracted using TRIzol Reagent from Invitrogen [Hypertext Transfer Protocol://World Wide Web (dot) invitrogen (dot) com/content (dot) cfm?pageid=469]. Approximately 30-50 mg of tissue was taken from samples. The weighed tissues were ground using pestle and mortar in liquid nitrogen and resuspended in 500 µl of TRIzol Reagent. To the homogenized lysate, 100 µl of chloroform was added followed by precipitation using isopropanol and two washes with 75% ethanol. The RNA was eluted in 30 µl of RNase-free water. RNA samples were cleaned up using Qiagen's RNeasy minikit clean-up protocol as per the manufacturer's protocol (QIAGEN Inc, CA USA). For convenience, each microarray expression information tissue type has received an expression Set ID.

Correlation analysis—was performed for selected genes according to some embodiments of the invention, in which the characterized parameters (measured parameters according to the correlation IDs) were used as "x axis" for correlation with the tissue transcriptom which was used as the "Y axis". For each gene and measured parameter a correlation coefficient "R" was calculated (using Pearson correlation) along with a p-value for the significance of the correlation. When the correlation coefficient (R) between the levels of a gene's expression in a certain tissue and a phenotypic performance across ecotypes/variety/hybrid is high in absolute value (between 0.5-1), there is an associa-

tion between the gene (specifically the expression level of this gene) the phenotypic characteristic (e.g., improved nitrogen use efficiency, abiotic stress tolerance, yield, growth rate and the like).

#### Example 1

Identifying Genes which Increase Nitrogen Use Efficiency (NUE), Fertilizer Use Efficiency (FUE), Yield, Growth Rate, Vigor, Biomass, Oil Content, Abiotic Stress Tolerance (ABST) and/or Water Use Efficiency (WUE) in Plants

The present inventors have identified polynucleotides which upregulation of expression thereof in plants increases nitrogen use efficiency (NUE), fertilizer use efficiency (FUE), yield (e.g., seed yield, oil yield, biomass, grain quantity and/or quality), growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance (ABST) and/or water use efficiency (WUE) of a plant.

All nucleotide sequence datasets used here were originated from publicly available databases or from performing sequencing using the Solexa technology (e.g. Barley and *Sorghum*). Sequence data from 100 different plant species was introduced into a single, comprehensive database. Other information on gene expression, protein annotation, enzymes and pathways were also incorporated. Major databases used include:

#### Genomes

*Arabidopsis* genome [TAIR genome version 6 (*arabidopsis* (dot) org/)]  
 Rice genome [IRGSP build 4.0 (rgp (dot) dna (dot) affrc (dot) go (dot) jp/IRGSP/)].  
 Poplar [*Populus trichocarpa* release 1.1 from JGI (assembly release v1.0) (genome (dot) jgi-psf (dot) org/)]  
*Brachypodium* [JGI 4x assembly, brachpodium (dot) org/]  
 Soybean [DOE-JGI SCP, version Glyma0 or Glyma1 (phytozome (dot) net/)]  
 Grape [French-Italian Public Consortium for Grapevine Genome Characterization grapevine genome (genoscope (dot) cns (dot) fr/)]  
 Castobean [TIGR/J Craig Venter Institute 4x assembly [(msc (dot) jevi (dot) org/r\_communis/]  
*Sorghum* [DOE-JGI SCP, version Sbi1 [phytozome (dot) net/)].  
 Maize [maizesequence (dot) org/]  
 Cucumber [cucumber (dot) genomics (dot) org (dot) cn/page/cucumber/index (dot) jsp]  
 Tomato [solgenomics (dot) net/tomato/]  
 Cassava [phytozome (dot) net/cassava (dot) php]  
 Expressed EST and mRNA sequences were extracted from the following databases:  
 GenBank (ncbi (dot) nlm (dot) nih (dot) gov/Genbank/).  
 RefSeq (ncbi (dot) nlm (dot) nih (dot) gov/RefSeq/).  
 TAIR (*arabidopsis* (dot) org/).  
 Protein and pathway databases  
 Uniprot [uniprot (dot) org/].  
 AraCyc [*arabidopsis* (dot) org/biocyc/index (dot) jsp].  
 ENZYME [expasy (dot) org/enzyme/].  
 Microarray datasets were downloaded from:  
 GEO (ncbi (dot) nlm (dot) nih (dot) gov/geo/)  
 TAIR (*Arabidopsis* (dot) org/).  
 Proprietary micro-array data (See WO2008/122980 and Examples 3-11 below).  
 QTL and SNPs information  
 Gramene [gramene (dot) org/ql/].  
 Panzea [panzea (dot) org/index (dot) html].  
 Soybean QTL: [soybeanbreederstoolbox(dot) com/].

Database Assembly—was performed to build a wide, rich, reliable annotated and easy database comprised of publicly available genomic mRNA, ESTs DNA sequences, data from various crops as well as gene expression, protein annotation and pathway, QTLs data, and other relevant information.

Database assembly is comprised of a toolbox of gene refining, structuring, annotation and analysis tools enabling to construct a tailored database for each gene discovery project. Gene refining and structuring tools enable to reliably detect splice variants and antisense transcripts, generating understanding of various potential phenotypic outcomes of a single gene. The capabilities of the “LEADS” platform of Compugen LTD for analyzing human genome have been confirmed and accepted by the scientific community [see e.g., “Widespread Antisense Transcription”, Yelin, et al. (2003) Nature Biotechnology 21, 379-85; “Splicing of Alu Sequences”, Lev-Maor, et al. (2003) Science 300 (5623), 1288-91; “Computational analysis of alternative splicing using EST tissue information”, Xie H et al. Genomics 2002], and have been proven most efficient in plant genomics as well.

EST clustering and gene assembly—For gene clustering and assembly of organisms with available genome sequence data (*arabidopsis*, rice, castorbean, grape, *brachypodium*, poplar, soybean, *sorghum*) the genomic LEADS version (GANG) was employed. This tool allows most accurate clustering of ESTs and mRNA sequences on genome, and predicts gene structure as well as alternative splicing events and anti-sense transcription.

For organisms with no available full genome sequence data, “expressed LEADS” clustering software was applied.

Gene annotation—Predicted genes and proteins were annotated as follows:

Sequences blast search [blast (dot) ncbi (dot) nlm (dot) nih (dot) gov/Blast (dot) cgi] against all plant UniProt [uniprot (dot) org/] was performed. Open reading frames of each putative transcript were analyzed and longest ORF with higher number of homologues was selected as predicted protein of the transcript. The predicted proteins were analyzed by InterPro [ebi (dot) ac (dot) uk/interpro/].

Blast against proteins from AraCyc and ENZYME databases was used to map the predicted transcripts to AraCyc pathways.

Predicted proteins from different species were compared using blast algorithm [ncbi (dot) nlm (dot) nih (dot) gov/Blast (dot) cgi] to validate the accuracy of the predicted protein sequence, and for efficient detection of orthologs.

Gene expression profiling—Several data sources were exploited for gene expression profiling, namely microarray data and digital expression profile (see below). According to gene expression profile, a correlation analysis was performed to identify genes which are co-regulated under different development stages and environmental conditions and associated with different phenotypes.

Publicly available microarray datasets were downloaded from TAIR and NCBI GEO sites, renormalized, and integrated into the database. Expression profiling is one of the most important resource data for identifying genes important for yield.

A digital expression profile summary was compiled for each cluster according to all keywords included in the sequence records comprising the cluster. Digital expression, also known as electronic Northern Blot, is a tool that displays virtual expression profile based on the EST sequences forming the gene cluster. The tool provides the expression profile of a cluster in terms of plant anatomy (e.g., the tissue/organ in which the gene is expressed), developmental stage (the developmental stages at which a gene can be found) and profile of treatment (provides the physiological conditions under which a gene is expressed such as drought, cold, pathogen infection, etc). Given a random distribution of ESTs in the different clusters, the digital expression provides a probability value that describes the probability of a cluster having a total of N ESTs to contain X ESTs from a certain collection of libraries. For the probability calculations, the following is taken into consideration: a) the number of ESTs in the cluster, b) the number of ESTs of the implicated and related libraries, c) the overall number of ESTs available representing the species. Thereby clusters with low probability values are highly enriched with ESTs from the group of libraries of interest indicating a specialized expression.

Recently, the accuracy of this system was demonstrated by Portnoy et al., 2009 (Analysis Of The Melon Fruit Transcriptome Based On 454 Pyrosequencing) in: Plant & Animal Genomes XVII Conference, San Diego, Calif. Transcriptomic analysis, based on relative EST abundance in data was performed by 454 pyrosequencing of cDNA representing mRNA of the melon fruit. Fourteen double strand cDNA samples obtained from two genotypes, two fruit tissues (flesh and rind) and four developmental stages were sequenced. GS FLX pyrosequencing (Roche/454 Life Sciences) of non-normalized and purified cDNA samples yielded 1,150,657 expressed sequence tags (ESTs) that assembled into 67,477 unigenes (32,357 singletons and 35,120 contigs). Analysis of the data obtained against the Cucurbit Genomics Database [icugi (dot) org/] confirmed the accuracy of the sequencing and assembly. Expression patterns of selected genes fitted well their qRT-PCR data.

Overall, 215 genes were identified to have a major impact on nitrogen use efficiency, fertilizer use efficiency, yield (e.g., seed yield, oil yield, grain quantity and/or quality), growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency when expression thereof is increased in plants. The identified genes, their curated polynucleotide and polypeptide sequences, as well as their updated sequences according to GenBank database are summarized in Table 1, hereinbelow.

TABLE 1

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag          | Organism | Polyn. SEQ | Polyp. SEQ |
|-----------|----------------------|----------|------------|------------|
|           |                      |          | ID NO:     | ID NO:     |
| LNU749    | barley 10v2 AV834836 | barley   | 1          | 496        |
| LNU749    | barley 10v2 AV834836 | barley   | 1          | 712        |
| LNU750    | barley 10v2 BE215751 | barley   | 2          | 497        |

TABLE 1-continued

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag                       | Organism       | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: |
|-----------|-----------------------------------|----------------|-------------------|-------------------|
| LNU750    | barley 10v2 BE215751              | barley         | 2                 | 497               |
| LNU751    | barley 10v2 BE413235              | barley         | 3                 | 498               |
| LNU752    | barley 10v2 BE421033              | barley         | 4                 | 499               |
| LNU753    | barley 10v2 BE422116              | barley         | 5                 | 500               |
| LNU754    | barley 10v2 BE601673              | barley         | 6                 | 501               |
| LNU756    | barley 10v2 BF620955              | barley         | 7                 | 502               |
| LNU757    | barley 10v2 BF624113              | barley         | 8                 | 503               |
| LNU758    | barley 10v2 BF629458              | barley         | 9                 | 504               |
| LNU759    | barley 10v2 BM376337              | barley         | 10                | 505               |
| LNU760    | barley 12v1 CX630466              | barley         | 11                | 506               |
| LNU761    | barley 12v1 AJ463320              | barley         | 12                | 507               |
| LNU762    | barley 12v1 AV834698              | barley         | 13                | 508               |
| LNU763    | barley 12v1 AV836421              | barley         | 14                | 509               |
| LNU764    | barley 12v1 AV914625              | barley         | 15                | 510               |
| LNU766    | barley 12v1 AW983189              | barley         | 16                | 511               |
| LNU767    | barley 12v1 BE196490              | barley         | 17                | 512               |
| LNU768    | barley 12v1 BE216887              | barley         | 18                | 513               |
| LNU769    | barley 12v1 BE437319              | barley         | 19                | 514               |
| LNU770    | barley 12v1 BE602491              | barley         | 20                | 515               |
| LNU771    | barley 12v1 BF064919              | barley         | 21                | 516               |
| LNU772    | barley 12v1 BF253521              | barley         | 22                | 517               |
| LNU773    | barley 12v1 BF256991              | barley         | 23                | 518               |
| LNU774    | barley 12v1 BF258839              | barley         | 24                | 519               |
| LNU775    | barley 12v1 BF266348              | barley         | 25                | 520               |
| LNU776    | barley 12v1 BF266777              | barley         | 26                | 521               |
| LNU777    | barley 12v1 BF628559              | barley         | 27                | 522               |
| LNU778    | barley 12v1 BG300262              | barley         | 28                | 523               |
| LNU779    | barley 12v1 BG309380              | barley         | 29                | 524               |
| LNU780    | barley 12v1 BI779788              | barley         | 30                | 525               |
| LNU781    | barley 12v1 BI948718              | barley         | 31                | 526               |
| LNU782    | barley 12v1 BI950988              | barley         | 32                | 527               |
| LNU783    | barley 12v1 BI957813              | barley         | 33                | 528               |
| LNU784    | barley 12v1 BQ762763              | barley         | 34                | 529               |
| LNU785    | barley 12v1 BU986731              | barley         | 35                | 530               |
| LNU786    | barley 12v1 EX599010              | barley         | 36                | 531               |
| LNU787    | brachypodium 12v1 BRADI1G37175    | brachypodium   | 37                | 532               |
| LNU788    | brachypodium 12v1 BRADI1G51187    | brachypodium   | 38                | 533               |
| LNU789    | brachypodium 12v1 BRADI1G64180    | brachypodium   | 39                | 534               |
| LNU790    | brachypodium 12v1 BRADI1G64950    | brachypodium   | 40                | 535               |
| LNU791    | brachypodium 12v1 BRADI1G69030    | brachypodium   | 41                | 536               |
| LNU792    | brachypodium 12v1 BRADI2G51430    | brachypodium   | 42                | 537               |
| LNU793    | brachypodium 12v1 BRADI2G53980    | brachypodium   | 43                | 538               |
| LNU794    | brachypodium 12v1 BRADI3G16630T2  | brachypodium   | 44                | 539               |
| LNU795    | brachypodium 12v1 BRADI4G01230    | brachypodium   | 45                | 540               |
| LNU796    | brachypodium 12v1 BRADI4G05020    | brachypodium   | 46                | 541               |
| LNU797    | brachypodium 12v1 BRADI4G07060    | brachypodium   | 47                | 542               |
| LNU798    | brachypodium 12v1 BRADI4G27334    | brachypodium   | 48                | 543               |
| LNU799    | brachypodium 12v1 BRADI4G29720    | brachypodium   | 49                | 544               |
| LNU800    | brachypodium 12v1 BRADI5G16060    | brachypodium   | 50                | 545               |
| LNU801    | foxtail_millet 11v3 PHY7SI000598M | foxtail_millet | 51                | 546               |
| LNU802    | foxtail_millet 11v3 PHY7SI000948M | foxtail_millet | 52                | 547               |
| LNU803    | foxtail_millet 11v3 PHY7SI003585M | foxtail_millet | 53                | 548               |

TABLE 1-continued

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag                       | Organism       | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: |
|-----------|-----------------------------------|----------------|-------------------|-------------------|
| LNU804    | foxtail_millet 11v3 PHY7SI009882M | foxtail_millet | 54                | 549               |
| LNU805    | foxtail_millet 11v3 PHY7SI013938M | foxtail_millet | 55                | 550               |
| LNU806    | foxtail_millet 11v3 PHY7SI014253M | foxtail_millet | 56                | 551               |
| LNU807    | foxtail_millet 11v3 PHY7SI021778M | foxtail_millet | 57                | 552               |
| LNU808    | foxtail_millet 11v3 PHY7SI023199M | foxtail_millet | 58                | 553               |
| LNU809    | foxtail_millet 11v3 PHY7SI036241M | foxtail_millet | 59                | 554               |
| LNU810    | foxtail_millet 11v3 SICRP086135   | foxtail_millet | 60                | 555               |
| LNU811    | maize 10v1 AI601011               | maize          | 61                | 556               |
| LNU813    | maize 10v1 AI629666               | maize          | 62                | 557               |
| LNU814    | maize 10v1 AI637029               | maize          | 63                | 558               |
| LNU815    | maize 10v1 AI979480               | maize          | 64                | 559               |
| LNU816    | maize 10v1 AI979737               | maize          | 65                | 560               |
| LNU817    | maize 10v1 AW231541               | maize          | 66                | 561               |
| LNU818    | maize 10v1 AW267199               | maize          | 67                | 562               |
| LNU819    | maize 10v1 AW282410               | maize          | 68                | 563               |
| LNU820    | maize 10v1 AW288911               | maize          | 69                | 564               |
| LNU821    | maize 10v1 AW497499               | maize          | 70                | 565               |
| LNU822    | maize 10v1 AW927651               | maize          | 71                | 566               |
| LNU823    | maize 10v1 BE512590               | maize          | 72                | 567               |
| LNU824    | maize 10v1 BE552882               | maize          | 73                | 568               |
| LNU825    | maize 10v1 BE575202               | maize          | 74                | 569               |
| LNU828    | maize 10v1 BG458848               | maize          | 75                | 570               |
| LNU829    | maize 10v1 BG549052               | maize          | 76                | 571               |
| LNU830    | maize 10v1 BI679654               | maize          | 77                | 572               |
| LNU831    | maize 10v1 BM269210               | maize          | 78                | 573               |
| LNU832    | maize 10v1 BM895367               | maize          | 79                | 574               |
| LNU833    | maize 10v1 BU036574               | maize          | 80                | 575               |
| LNU834    | maize 10v1 CB816561               | maize          | 81                | 576               |
| LNU835    | maize 10v1 CD986056               | maize          | 82                | 577               |
| LNU837    | maize 10v1 CF064369               | maize          | 83                | 578               |
| LNU838    | maize 10v1 CF634284               | maize          | 84                | 579               |
| LNU839    | maize 10v1 CO523359               | maize          | 85                | 580               |
| LNU840    | maize 10v1 DN208554               | maize          | 86                | 581               |
| LNU841    | maize 10v1 DN225757               | maize          | 87                | 582               |
| LNU843    | maize 10v1 EE187987               | maize          | 88                | 583               |
| LNU844    | maize 10v1 T18396                 | maize          | 89                | 584               |
| LNU845    | maize 10v1 W21625                 | maize          | 90                | 585               |
| LNU846    | maize gb170 AF093537              | maize          | 91                | 586               |
| LNU847    | medicago 12v1 AL366283            | medicago       | 92                | 587               |
| LNU848    | rice 11v1 AF072694                | rice           | 93                | 588               |
| LNU849    | rice 11v1 AU057716                | rice           | 94                | 589               |
| LNU850    | rice 11v1 BI306328                | rice           | 95                | 590               |
| LNU851    | rice 11v1 BI813446                | rice           | 96                | 591               |
| LNU852    | rice 11v1 CA764428                | rice           | 97                | 592               |
| LNU853    | rice 11v1 CB645176                | rice           | 98                | 593               |
| LNU854    | rice 11v1 GFXAF377947X27          | rice           | 99                | 594               |
| LNU856    | sorghum 09v1 SB10G011070          | sorghum        | 100               | 595               |
| LNU857    | sorghum 11v1 SB10G007600          | sorghum        | 101               | 596               |
| LNU858    | sorghum 12v1 AW285114             | sorghum        | 102               | 597               |
| LNU861    | sorghum 12v1 BE918914             | sorghum        | 103               | 598               |
| LNU862    | sorghum 12v1 BG356040             | sorghum        | 104               | 599               |
| LNU864    | sorghum 12v1 CD424245             | sorghum        | 105               | 600               |
| LNU865    | sorghum 12v1 SB0169S002030        | sorghum        | 106               | 601               |
| LNU866    | sorghum 12v1 SB01G003110          | sorghum        | 107               | 602               |
| LNU867    | sorghum 12v1 SB01G004510          | sorghum        | 108               | 603               |
| LNU868    | sorghum 12v1 SB01G005240          | sorghum        | 109               | 604               |
| LNU869    | sorghum 12v1 SB01G006870          | sorghum        | 110               | 605               |
| LNU870    | sorghum 12v1 SB01G006930          | sorghum        | 111               | 606               |
| LNU871    | sorghum 12v1 SB01G007380          | sorghum        | 112               | 607               |
| LNU872    | sorghum 12v1 SB01G011260          | sorghum        | 113               | 608               |
| LNU873    | sorghum 12v1 SB01G011890          | sorghum        | 114               | 609               |
| LNU874    | sorghum 12v1 SB01G015540          | sorghum        | 115               | 610               |
| LNU875    | sorghum 12v1 SB01G017100          | sorghum        | 116               | 611               |
| LNU876    | sorghum 12v1 SB01G032593P1        | sorghum        | 117               | 612               |
| LNU878    | sorghum 12v1 SB01G035780          | sorghum        | 118               | 613               |

TABLE 1-continued

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag                      | Organism       | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: |
|-----------|----------------------------------|----------------|-------------------|-------------------|
| LNU879    | <i>sorghum</i>  12v1 SB01G040060 | <i>sorghum</i> | 119               | 614               |
| LNU880    | <i>sorghum</i>  12v1 SB01G046630 | <i>sorghum</i> | 120               | 615               |
| LNU881    | <i>sorghum</i>  12v1 SB01G047345 | <i>sorghum</i> | 121               | 616               |
| LNU882    | <i>sorghum</i>  12v1 SB01G048200 | <i>sorghum</i> | 122               | 617               |
| LNU883    | <i>sorghum</i>  12v1 SB01G048670 | <i>sorghum</i> | 123               | 618               |
| LNU884    | <i>sorghum</i>  12v1 SB01G048910 | <i>sorghum</i> | 124               | 619               |
| LNU885    | <i>sorghum</i>  12v1 SB02G001450 | <i>sorghum</i> | 125               | 620               |
| LNU886    | <i>sorghum</i>  12v1 SB02G002020 | <i>sorghum</i> | 126               | 621               |
| LNU887    | <i>sorghum</i>  12v1 SB02G003980 | <i>sorghum</i> | 127               | 622               |
| LNU888    | <i>sorghum</i>  12v1 SB02G009320 | <i>sorghum</i> | 128               | 623               |
| LNU889    | <i>sorghum</i>  12v1 SB02G023760 | <i>sorghum</i> | 129               | 624               |
| LNU890    | <i>sorghum</i>  12v1 SB02G027260 | <i>sorghum</i> | 130               | 625               |
| LNU892    | <i>sorghum</i>  12v1 SB02G033210 | <i>sorghum</i> | 131               | 626               |
| LNU893    | <i>sorghum</i>  12v1 SB02G036470 | <i>sorghum</i> | 132               | 627               |
| LNU894    | <i>sorghum</i>  12v1 SB02G039430 | <i>sorghum</i> | 133               | 628               |
| LNU895    | <i>sorghum</i>  12v1 SB02G042020 | <i>sorghum</i> | 134               | 629               |
| LNU896    | <i>sorghum</i>  12v1 SB02G043060 | <i>sorghum</i> | 135               | 630               |
| LNU897    | <i>sorghum</i>  12v1 SB02G043340 | <i>sorghum</i> | 136               | 631               |
| LNU898    | <i>sorghum</i>  12v1 SB03G001900 | <i>sorghum</i> | 137               | 632               |
| LNU899    | <i>sorghum</i>  12v1 SB03G003880 | <i>sorghum</i> | 138               | 633               |
| LNU900    | <i>sorghum</i>  12v1 SB03G004920 | <i>sorghum</i> | 139               | 634               |
| LNU901    | <i>sorghum</i>  12v1 SB03G006670 | <i>sorghum</i> | 140               | 635               |
| LNU902    | <i>sorghum</i>  12v1 SB03G009240 | <i>sorghum</i> | 141               | 636               |
| LNU903    | <i>sorghum</i>  12v1 SB03G013600 | <i>sorghum</i> | 142               | 637               |
| LNU904    | <i>sorghum</i>  12v1 SB03G015670 | <i>sorghum</i> | 143               | 638               |
| LNU905    | <i>sorghum</i>  12v1 SB03G025980 | <i>sorghum</i> | 144               | 639               |
| LNU906    | <i>sorghum</i>  12v1 SB03G028220 | <i>sorghum</i> | 145               | 640               |
| LNU907    | <i>sorghum</i>  12v1 SB03G029160 | <i>sorghum</i> | 146               | 641               |
| LNU908    | <i>sorghum</i>  12v1 SB03G030720 | <i>sorghum</i> | 147               | 642               |
| LNU909    | <i>sorghum</i>  12v1 SB03G032235 | <i>sorghum</i> | 148               | 643               |
| LNU910    | <i>sorghum</i>  12v1 SB03G034870 | <i>sorghum</i> | 149               | 644               |
| LNU911    | <i>sorghum</i>  12v1 SB03G035900 | <i>sorghum</i> | 150               | 645               |
| LNU912    | <i>sorghum</i>  12v1 SB03G037390 | <i>sorghum</i> | 151               | 646               |
| LNU913    | <i>sorghum</i>  12v1 SB03G039370 | <i>sorghum</i> | 152               | 647               |
| LNU914    | <i>sorghum</i>  12v1 SB04G000560 | <i>sorghum</i> | 153               | 648               |
| LNU915    | <i>sorghum</i>  12v1 SB04G000860 | <i>sorghum</i> | 154               | 649               |
| LNU916    | <i>sorghum</i>  12v1 SB04G003110 | <i>sorghum</i> | 155               | 650               |
| LNU917    | <i>sorghum</i>  12v1 SB04G005810 | <i>sorghum</i> | 156               | 651               |
| LNU918    | <i>sorghum</i>  12v1 SB04G005960 | <i>sorghum</i> | 157               | 652               |
| LNU919    | <i>sorghum</i>  12v1 SB04G008660 | <i>sorghum</i> | 158               | 653               |
| LNU920    | <i>sorghum</i>  12v1 SB04G019220 | <i>sorghum</i> | 159               | 654               |
| LNU921    | <i>sorghum</i>  12v1 SB04G023720 | <i>sorghum</i> | 160               | 655               |
| LNU922    | <i>sorghum</i>  12v1 SB04G031020 | <i>sorghum</i> | 161               | 656               |
| LNU923    | <i>sorghum</i>  12v1 SB04G031630 | <i>sorghum</i> | 162               | 657               |
| LNU924    | <i>sorghum</i>  12v1 SB04G031790 | <i>sorghum</i> | 163               | 658               |
| LNU925    | <i>sorghum</i>  12v1 SB04G031980 | <i>sorghum</i> | 164               | 659               |
| LNU926    | <i>sorghum</i>  12v1 SB04G032240 | <i>sorghum</i> | 165               | 660               |
| LNU928    | <i>sorghum</i>  12v1 SB04G035530 | <i>sorghum</i> | 166               | 661               |
| LNU929    | <i>sorghum</i>  12v1 SB04G036780 | <i>sorghum</i> | 167               | 662               |
| LNU930    | <i>sorghum</i>  12v1 SB04G037720 | <i>sorghum</i> | 168               | 663               |
| LNU931    | <i>sorghum</i>  12v1 SB05G000570 | <i>sorghum</i> | 169               | 664               |
| LNU932    | <i>sorghum</i>  12v1 SB05G001300 | <i>sorghum</i> | 170               | 665               |
| LNU933    | <i>sorghum</i>  12v1 SB05G005230 | <i>sorghum</i> | 171               | 666               |
| LNU934    | <i>sorghum</i>  12v1 SB05G006950 | <i>sorghum</i> | 172               | 667               |
| LNU935    | <i>sorghum</i>  12v1 SB05G020340 | <i>sorghum</i> | 173               | 668               |
| LNU936    | <i>sorghum</i>  12v1 SB05G021410 | <i>sorghum</i> | 174               | 669               |
| LNU938    | <i>sorghum</i>  12v1 SB05G025900 | <i>sorghum</i> | 175               | 670               |
| LNU939    | <i>sorghum</i>  12v1 SB06G015080 | <i>sorghum</i> | 176               | 671               |
| LNU940    | <i>sorghum</i>  12v1 SB06G016140 | <i>sorghum</i> | 177               | 672               |
| LNU941    | <i>sorghum</i>  12v1 SB06G018480 | <i>sorghum</i> | 178               | 673               |
| LNU942    | <i>sorghum</i>  12v1 SB06G019950 | <i>sorghum</i> | 179               | 674               |
| LNU943    | <i>sorghum</i>  12v1 SB06G020900 | <i>sorghum</i> | 180               | 675               |
| LNU944    | <i>sorghum</i>  12v1 SB07G000250 | <i>sorghum</i> | 181               | 676               |
| LNU945    | <i>sorghum</i>  12v1 SB07G004040 | <i>sorghum</i> | 182               | 677               |
| LNU946    | <i>sorghum</i>  12v1 SB07G004390 | <i>sorghum</i> | 183               | 678               |
| LNU947    | <i>sorghum</i>  12v1 SB07G021870 | <i>sorghum</i> | 184               | 679               |
| LNU948    | <i>sorghum</i>  12v1 SB07G027790 | <i>sorghum</i> | 185               | 680               |
| LNU949    | <i>sorghum</i>  12v1 SB08G002580 | <i>sorghum</i> | 186               | 681               |
| LNU950    | <i>sorghum</i>  12v1 SB08G002740 | <i>sorghum</i> | 187               | 682               |
| LNU951    | <i>sorghum</i>  12v1 SB08G003140 | <i>sorghum</i> | 188               | 683               |
| LNU952    | <i>sorghum</i>  12v1 SB08G007610 | <i>sorghum</i> | 189               | 684               |
| LNU953    | <i>sorghum</i>  12v1 SB08G015020 | <i>sorghum</i> | 190               | 685               |

TABLE 1-continued

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag                       | Organism        | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: |
|-----------|-----------------------------------|-----------------|-------------------|-------------------|
| LNU954    | <i>sorghum</i>  12v1 SB08G016400  | <i>sorghum</i>  | 191               | 686               |
| LNU955    | <i>sorghum</i>  12v1 SB08G016530  | <i>sorghum</i>  | 192               | 687               |
| LNU956    | <i>sorghum</i>  12v1 SB08G018765  | <i>sorghum</i>  | 193               | 688               |
| LNU957    | <i>sorghum</i>  12v1 SB08G020600  | <i>sorghum</i>  | 194               | 689               |
| LNU958    | <i>sorghum</i>  12v1 SB08G021920  | <i>sorghum</i>  | 195               | 690               |
| LNU959    | <i>sorghum</i>  12v1 SB09G021265  | <i>sorghum</i>  | 196               | 691               |
| LNU960    | <i>sorghum</i>  12v1 SB09G021520  | <i>sorghum</i>  | 197               | 692               |
| LNU961    | <i>sorghum</i>  12v1 SB09G026930  | <i>sorghum</i>  | 198               | 693               |
| LNU962    | <i>sorghum</i>  12v1 SB09G026990  | <i>sorghum</i>  | 199               | 694               |
| LNU963    | <i>sorghum</i>  12v1 SB10G002960  | <i>sorghum</i>  | 200               | 695               |
| LNU964    | <i>sorghum</i>  12v1 SB10G023640  | <i>sorghum</i>  | 201               | 696               |
| LNU965    | <i>sorghum</i>  12v1 SB10G026450  | <i>sorghum</i>  | 202               | 697               |
| LNU966    | <i>sorghum</i>  12v1 SB10G026910  | <i>sorghum</i>  | 203               | 698               |
| LNU967    | <i>sorghum</i>  12v1 SB10G028680  | <i>sorghum</i>  | 204               | 699               |
| LNU968    | <i>sorghum</i>  12v1 SB10G030200  | <i>sorghum</i>  | 205               | 700               |
| LNU969    | <i>sorghum</i>  12v1 XM_002468645 | <i>sorghum</i>  | 206               | 701               |
| LNU970    | soybean 11v1 GLYMA13G20220        | soybean         | 207               | 702               |
| LNU971    | tomato 11v1 AI772930              | tomato          | 208               | 703               |
| LNU972    | tomato 11v1 AI775263              | tomato          | 209               | 704               |
| LNU975    | tomato 11v1 BI422101              | tomato          | 210               | 705               |
| LNU976    | wheat 12v3 CA596628               | wheat           | 211               | 706               |
| LNU977    | wheat 12v3 CK152213               | wheat           | 212               | 707               |
| LNU760_H1 | brachypodium 12v1 BRADI1G02117    | brachypodium    | 213               | 708               |
| LNU832_H2 | <i>sorghum</i>  12v1 SB03G013780  | <i>sorghum</i>  | 214               | 709               |
| LNU834_H1 | <i>sorghum</i>  12v1 SB02G003380  | <i>sorghum</i>  | 215               | 710               |
| LNU861_H3 | maize 10v1 CF635645               | maize           | 216               | 711               |
| LNU859    | <i>sorghum</i>  12v1 AW677786     | <i>sorghum</i>  | 217               |                   |
| LNU860    | <i>sorghum</i>  12v1 BE362249     | <i>sorghum</i>  | 218               |                   |
| LNU863    | <i>sorghum</i>  12v1 BG410755     | <i>sorghum</i>  | 219               |                   |
| LNU750    | barley 10v2 BE215751              | barley          | 220               | 713               |
| LNU760    | barley 10v2 CX630466              | barley          | 221               | 714               |
| LNU771    | barley 12v1 BF064919              | barley          | 222               | 715               |
| LNU772    | barley 12v1 BF253521              | barley          | 223               | 716               |
| LNU783    | barley 12v1 BI957813              | barley          | 224               | 528               |
| LNU785    | barley 12v1 BU986731              | barley          | 225               | 717               |
| LNU786    | barley 12v1 EX599010              | barley          | 226               | 718               |
| LNU787    | brachypodium 12v1 BRADI1G37175    | brachypodium    | 227               | 719               |
| LNU790    | brachypodium 12v1 BRADI1G64950    | brachypodium    | 228               | 535               |
| LNU792    | brachypodium 12v1 BRADI2G51430    | brachypodium    | 229               | 537               |
| LNU793    | brachypodium 12v1 BRADI2G53980    | brachypodium    | 230               | 538               |
| LNU795    | brachypodium 12v1 BRADI4G01230    | brachypodium    | 231               | 720               |
| LNU801    | foxtail_millet 11v3 PHY7SI000598M | foxtail_millet  | 232               | 546               |
| LNU802    | foxtail_millet 11v3 PHY7SI000948M | foxtail_millet  | 233               | 547               |
| LNU806    | foxtail_millet 11v3 PHY7SI014253M | foxtail_millet  | 234               | 721               |
| LNU807    | foxtail_millet 11v3 PHY7SI021778M | foxtail_millet  | 235               | 552               |
| LNU830    | maize 10v1 BI679654               | maize           | 236               | 572               |
| LNU837    | maize 10v1 CF064369               | maize           | 237               | 722               |
| LNU839    | maize 10v1 CO523359               | maize           | 238               | 580               |
| LNU843    | maize 10v1 EE187987               | maize           | 239               | 723               |
| LNU845    | maize 10v1 W21625                 | maize           | 240               | 724               |
| LNU847    | <i>medicago</i>  12v1 AL366283    | <i>medicago</i> | 241               | 725               |
| LNU848    | rice 11v1 AF072694                | rice            | 242               | 588               |
| LNU851    | rice 11v1 BI1813446               | rice            | 243               | 591               |
| LNU856    | <i>sorghum</i>  09v1 SB10G011070  | <i>sorghum</i>  | 244               | 726               |
| LNU858    | <i>sorghum</i>  12v1 AW285114     | <i>sorghum</i>  | 245               | 727               |
| LNU862    | <i>sorghum</i>  12v1 BG356040     | <i>sorghum</i>  | 246               | 728               |
| LNU864    | <i>sorghum</i>  12v1 CD424245     | <i>sorghum</i>  | 247               | 600               |
| LNU866    | <i>sorghum</i>  12v1 SB01G003110  | <i>sorghum</i>  | 248               | 729               |
| LNU870    | <i>sorghum</i>  12v1 SB01G006930  | <i>sorghum</i>  | 249               | 730               |

TABLE 1-continued

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag                        | Organism       | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: |
|-----------|------------------------------------|----------------|-------------------|-------------------|
| LNU873    | <i>sorghum</i>  12v1 SB01G011890   | <i>sorghum</i> | 250               | 609               |
| LNU876    | <i>sorghum</i>  12v1 SB01G032593P1 | <i>sorghum</i> | 251               | 612               |
| LNU886    | <i>sorghum</i>  12v1 SB02G002020   | <i>sorghum</i> | 252               | 731               |
| LNU887    | <i>sorghum</i>  12v1 SB02G003980   | <i>sorghum</i> | 253               | 622               |
| LNU889    | <i>sorghum</i>  12v1 SB02G023760   | <i>sorghum</i> | 254               | 624               |
| LNU892    | <i>sorghum</i>  12v1 SB02G033210   | <i>sorghum</i> | 255               | 732               |
| LNU896    | <i>sorghum</i>  12v1 SB02G043060   | <i>sorghum</i> | 256               | 733               |
| LNU897    | <i>sorghum</i>  12v1 SB02G043340   | <i>sorghum</i> | 257               | 631               |
| LNU902    | <i>sorghum</i>  12v1 SB03G009240   | <i>sorghum</i> | 258               | 636               |
| LNU905    | <i>sorghum</i>  12v1 SB03G025980   | <i>sorghum</i> | 259               | 639               |
| LNU906    | <i>sorghum</i>  12v1 SB03G028220   | <i>sorghum</i> | 260               | 734               |
| LNU908    | <i>sorghum</i>  12v1 SB03G030720   | <i>sorghum</i> | 261               | 735               |
| LNU910    | <i>sorghum</i>  12v1 SB03G034870   | <i>sorghum</i> | 262               | 736               |
| LNU911    | <i>sorghum</i>  12v1 SB03G035900   | <i>sorghum</i> | 263               | 737               |
| LNU914    | <i>sorghum</i>  12v1 SB04G000560   | <i>sorghum</i> | 264               | 648               |
| LNU919    | <i>sorghum</i>  12v1 SB04G008660   | <i>sorghum</i> | 265               | 653               |
| LNU920    | <i>sorghum</i>  12v1 SB04G019220   | <i>sorghum</i> | 266               | 654               |
| LNU921    | <i>sorghum</i>  12v1 SB04G023720   | <i>sorghum</i> | 267               | 655               |
| LNU926    | <i>sorghum</i>  12v1 SB04G032240   | <i>sorghum</i> | 268               | 660               |
| LNU929    | <i>sorghum</i>  12v1 SB04G036780   | <i>sorghum</i> | 269               | 662               |
| LNU931    | <i>sorghum</i>  12v1 SB05G000570   | <i>sorghum</i> | 270               | 664               |
| LNU932    | <i>sorghum</i>  12v1 SB05G001300   | <i>sorghum</i> | 271               | 738               |
| LNU935    | <i>sorghum</i>  12v1 SB05G020340   | <i>sorghum</i> | 272               | 668               |
| LNU936    | <i>sorghum</i>  12v1 SB05G021410   | <i>sorghum</i> | 273               | 669               |
| LNU938    | <i>sorghum</i>  12v1 SB05G025900   | <i>sorghum</i> | 274               | 670               |
| LNU946    | <i>sorghum</i>  12v1 SB07G004390   | <i>sorghum</i> | 275               | 678               |
| LNU951    | <i>sorghum</i>  12v1 SB08G003140   | <i>sorghum</i> | 276               | 739               |
| LNU954    | <i>sorghum</i>  12v1 SB08G016400   | <i>sorghum</i> | 277               | 740               |
| LNU956    | <i>sorghum</i>  12v1 SB08G018765   | <i>sorghum</i> | 278               | 741               |
| LNU960    | <i>sorghum</i>  12v1 SB09G021520   | <i>sorghum</i> | 279               | 692               |
| LNU962    | <i>sorghum</i>  12v1 SB09G026990   | <i>sorghum</i> | 280               | 694               |
| LNU967    | <i>sorghum</i>  12v1 SB10G028680   | <i>sorghum</i> | 281               | 699               |
| LNU969    | <i>sorghum</i>  12v1 XM_002468645  | <i>sorghum</i> | 282               | 742               |
| LNU972    | tomato 11v1 AI775263               | tomato         | 283               | 743               |
| LNU975    | tomato 11v1 BI422101               | tomato         | 284               | 744               |
| LNU977    | wheat 12v3 CK152213                | wheat          | 285               | 745               |
| LNU861_H3 | maize 10v1 CF635645                | maize          | 286               | 746               |
| LNU859    | <i>sorghum</i>  12v1 AW677786      | <i>sorghum</i> | 287               |                   |
| LNU863    | <i>sorghum</i>  12v1 BG410755      | <i>sorghum</i> | 288               |                   |
| LNU749    | barley 10v2 AV834836               | barley         | 289               | 747               |
| LNU751    | barley 10v2 BE413235               | barley         | 290               | 498               |
| LNU752    | barley 10v2 BE421033               | barley         | 291               | 748               |
| LNU753    | barley 10v2 BE422116               | barley         | 292               | 500               |
| LNU754    | barley 10v2 BE601673               | barley         | 293               | 501               |
| LNU756    | barley 10v2 BF620955               | barley         | 294               | 502               |
| LNU757    | barley 10v2 BF624113               | barley         | 295               | 503               |
| LNU758    | barley 10v2 BF629458               | barley         | 296               | 504               |
| LNU759    | barley 10v2 BM376337               | barley         | 297               | 505               |
| LNU761    | barley 12v1 AJ463320               | barley         | 298               | 507               |
| LNU762    | barley 12v1 AV834698               | barley         | 299               | 508               |
| LNU763    | barley 12v1 AV836421               | barley         | 300               | 509               |
| LNU764    | barley 12v1 AV914625               | barley         | 301               | 510               |
| LNU766    | barley 12v1 AW983189               | barley         | 302               | 749               |
| LNU767    | barley 12v1 BE196490               | barley         | 303               | 512               |
| LNU768    | barley 12v1 BE216887               | barley         | 304               | 513               |
| LNU769    | barley 12v1 BE437319               | barley         | 305               | 750               |
| LNU770    | barley 12v1 BE602491               | barley         | 306               | 515               |
| LNU771    | barley 12v1 BF064919               | barley         | 307               | 516               |
| LNU772    | barley 12v1 BF253521               | barley         | 308               | 517               |
| LNU773    | barley 12v1 BF256991               | barley         | 309               | 751               |
| LNU774    | barley 12v1 BF258839               | barley         | 310               | 519               |
| LNU775    | barley 12v1 BF266348               | barley         | 311               | 520               |
| LNU776    | barley 12v1 BF266777               | barley         | 312               | 752               |
| LNU777    | barley 12v1 BF628559               | barley         | 313               | 522               |
| LNU778    | barley 12v1 BG300262               | barley         | 314               | 523               |
| LNU779    | barley 12v1 BG309380               | barley         | 315               | 524               |
| LNU780    | barley 12v1 BI779788               | barley         | 316               | 753               |
| LNU781    | barley 12v1 BI948718               | barley         | 317               | 526               |
| LNU782    | barley 12v1 BI950988               | barley         | 318               | 527               |
| LNU783    | barley 12v1 BI957813               | barley         | 319               | 528               |
| LNU784    | barley 12v1 BQ762763               | barley         | 320               | 754               |

TABLE 1-continued

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag                       | Organism       | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: |
|-----------|-----------------------------------|----------------|-------------------|-------------------|
| LNU785    | barley 12v1 BU986731              | barley         | 321               | 530               |
| LNU786    | barley 12v1 EX599010              | barley         | 322               | 755               |
| LNU787    | brachypodium 12v1 BRADI1G37175    | brachypodium   | 323               | 532               |
| LNU788    | brachypodium 12v1 BRADI1G51187    | brachypodium   | 324               | 756               |
| LNU789    | brachypodium 12v1 BRADI1G64180    | brachypodium   | 325               | 534               |
| LNU790    | brachypodium 12v1 BRADI1G64950    | brachypodium   | 326               | 535               |
| LNU791    | brachypodium 12v1 BRADI1G69030    | brachypodium   | 327               | 536               |
| LNU792    | brachypodium 12v1 BRADI2G51430    | brachypodium   | 328               | 537               |
| LNU793    | brachypodium 12v1 BRADI2G53980    | brachypodium   | 329               | 538               |
| LNU794    | brachypodium 12v1 BRADI3G16630T2  | brachypodium   | 330               | 539               |
| LNU795    | brachypodium 12v1 BRADI4G01230    | brachypodium   | 331               | 757               |
| LNU796    | brachypodium 12v1 BRADI4G05020    | brachypodium   | 332               | 541               |
| LNU797    | brachypodium 12v1 BRADI4G07060    | brachypodium   | 333               | 542               |
| LNU798    | brachypodium 12v1 BRADI4G27334    | brachypodium   | 334               | 543               |
| LNU799    | brachypodium 12v1 BRADI4G29720    | brachypodium   | 335               | 544               |
| LNU800    | brachypodium 12v1 BRADI5G16060    | brachypodium   | 336               | 545               |
| LNU801    | foxtail_millet 11v3 PHY7SI000598M | foxtail_millet | 337               | 546               |
| LNU802    | foxtail_millet 11v3 PHY7SI000948M | foxtail_millet | 338               | 547               |
| LNU803    | foxtail_millet 11v3 PHY7SI003585M | foxtail_millet | 339               | 548               |
| LNU804    | foxtail_millet 11v3 PHY7SI009882M | foxtail_millet | 340               | 758               |
| LNU805    | foxtail_millet 11v3 PHY7SI013938M | foxtail_millet | 341               | 550               |
| LNU806    | foxtail_millet 11v3 PHY7SI014253M | foxtail_millet | 342               | 759               |
| LNU807    | foxtail_millet 11v3 PHY7SI021778M | foxtail_millet | 343               | 552               |
| LNU808    | foxtail_millet 11v3 PHY7SI023199M | foxtail_millet | 344               | 553               |
| LNU809    | foxtail_millet 11v3 PHY7SI036241M | foxtail_millet | 345               | 760               |
| LNU811    | maize 10v1 AI601011               | maize          | 346               | 556               |
| LNU813    | maize 10v1 AI629666               | maize          | 347               | 557               |
| LNU814    | maize 10v1 AI637029               | maize          | 348               | 558               |
| LNU815    | maize 10v1 AI979480               | maize          | 349               | 559               |
| LNU816    | maize 10v1 AI979737               | maize          | 350               | 761               |
| LNU817    | maize 10v1 AW231541               | maize          | 351               | 762               |
| LNU818    | maize 10v1 AW267199               | maize          | 352               | 763               |
| LNU819    | maize 10v1 AW282410               | maize          | 353               | 563               |
| LNU820    | maize 10v1 AW288911               | maize          | 354               | 564               |
| LNU821    | maize 10v1 AW497499               | maize          | 355               | 764               |
| LNU822    | maize 10v1 AW927651               | maize          | 356               | 566               |
| LNU823    | maize 10v1 BE512590               | maize          | 357               | 567               |
| LNU824    | maize 10v1 BE552882               | maize          | 358               | 765               |
| LNU825    | maize 10v1 BE575202               | maize          | 359               | 766               |
| LNU828    | maize 10v1 BG458848               | maize          | 360               | 570               |
| LNU829    | maize 10v1 BG549052               | maize          | 361               | 767               |
| LNU830    | maize 10v1 B1679654               | maize          | 362               | 572               |
| LNU831    | maize 10v1 BM269210               | maize          | 363               | 768               |
| LNU833    | maize 10v1 BUO36574               | maize          | 364               | 769               |
| LNU835    | maize 10v1 CD986056               | maize          | 365               | 577               |
| LNU837    | maize 10v1 CF064369               | maize          | 366               | 770               |
| LNU838    | maize 10v1 CF634284               | maize          | 367               | 579               |
| LNU839    | maize 10v1 CO523359               | maize          | 368               | 580               |
| LNU840    | maize 10v1 DN208554               | maize          | 369               | 581               |

TABLE 1-continued

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag                | Organism | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: |
|-----------|----------------------------|----------|-------------------|-------------------|
| LNU841    | maize 10v1 DN225757        | maize    | 370               | 582               |
| LNU843    | maize 10v1 EE187987        | maize    | 371               | 583               |
| LNU844    | maize 10v1 T18396          | maize    | 372               | 584               |
| LNU845    | maize 10v1 W21625          | maize    | 373               | 771               |
| LNU846    | maize gb170 AF093537       | maize    | 374               | 586               |
| LNU847    | medicago 12v1 AL366283     | medicago | 375               | 772               |
| LNU848    | rice 11v1 AF072694         | rice     | 376               | 588               |
| LNU849    | rice 11v1 AU057716         | rice     | 377               | 589               |
| LNU850    | rice 11v1 BI306328         | rice     | 378               | 590               |
| LNU851    | rice 11v1 BI813446         | rice     | 379               | 591               |
| LNU852    | rice 11v1 CA764428         | rice     | 380               | 592               |
| LNU853    | rice 11v1 CB645176         | rice     | 381               | 593               |
| LNU854    | rice 11v1 GFXAF377947X27   | rice     | 382               | 594               |
| LNU856    | sorghum 09v1 SB10G011070   | sorghum  | 383               | 595               |
| LNU857    | sorghum 11v1 SB10G007600   | sorghum  | 384               | 773               |
| LNU858    | sorghum 12v1 AW285114      | sorghum  | 385               | 774               |
| LNU862    | sorghum 12v1 BG356040      | sorghum  | 386               | 599               |
| LNU864    | sorghum 12v1 CD424245      | sorghum  | 387               | 600               |
| LNU865    | sorghum 12v1 SB0169S002030 | sorghum  | 388               | 601               |
| LNU866    | sorghum 12v1 SB01G003110   | sorghum  | 389               | 775               |
| LNU867    | sorghum 12v1 SB01G004510   | sorghum  | 390               | 603               |
| LNU868    | sorghum 12v1 SB01G005240   | sorghum  | 391               | 604               |
| LNU869    | sorghum 12v1 SB01G006870   | sorghum  | 392               | 605               |
| LNU870    | sorghum 12v1 SB01G006930   | sorghum  | 393               | 606               |
| LNU871    | sorghum 12v1 SB01G007380   | sorghum  | 394               | 607               |
| LNU872    | sorghum 12v1 SB01G011260   | sorghum  | 395               | 608               |
| LNU873    | sorghum 12v1 SB01G011890   | sorghum  | 396               | 609               |
| LNU874    | sorghum 12v1 SB01G015540   | sorghum  | 397               | 610               |
| LNU875    | sorghum 12v1 SB01G017100   | sorghum  | 398               | 611               |
| LNU876    | sorghum 12v1 SB01G032593P1 | sorghum  | 399               | 612               |
| LNU878    | sorghum 12v1 SB01G035780   | sorghum  | 400               | 613               |
| LNU879    | sorghum 12v1 SB01G040060   | sorghum  | 401               | 614               |
| LNU880    | sorghum 12v1 SB01G046630   | sorghum  | 402               | 615               |
| LNU881    | sorghum 12v1 SB01G047345   | sorghum  | 403               | 616               |
| LNU882    | sorghum 12v1 SB01G048200   | sorghum  | 404               | 617               |
| LNU884    | sorghum 12v1 SB01G048910   | sorghum  | 405               | 619               |
| LNU885    | sorghum 12v1 SB02G001450   | sorghum  | 406               | 620               |
| LNU886    | sorghum 12v1 SB02G002020   | sorghum  | 407               | 776               |
| LNU887    | sorghum 12v1 SB02G003980   | sorghum  | 408               | 622               |
| LNU888    | sorghum 12v1 SB02G009320   | sorghum  | 409               | 623               |
| LNU889    | sorghum 12v1 SB02G023760   | sorghum  | 410               | 624               |
| LNU890    | sorghum 12v1 SB02G027260   | sorghum  | 411               | 625               |
| LNU892    | sorghum 12v1 SB02G033210   | sorghum  | 412               | 626               |
| LNU893    | sorghum 12v1 SB02G036470   | sorghum  | 413               | 627               |
| LNU894    | sorghum 12v1 SB02G039430   | sorghum  | 414               | 628               |
| LNU895    | sorghum 12v1 SB02G042020   | sorghum  | 415               | 629               |
| LNU896    | sorghum 12v1 SB02G043060   | sorghum  | 416               | 630               |
| LNU897    | sorghum 12v1 SB02G043340   | sorghum  | 417               | 777               |
| LNU898    | sorghum 12v1 SB03G001900   | sorghum  | 418               | 778               |
| LNU899    | sorghum 12v1 SB03G003880   | sorghum  | 419               | 633               |
| LNU900    | sorghum 12v1 SB03G004920   | sorghum  | 420               | 779               |
| LNU901    | sorghum 12v1 SB03G006670   | sorghum  | 421               | 780               |
| LNU902    | sorghum 12v1 SB03G009240   | sorghum  | 422               | 636               |
| LNU903    | sorghum 12v1 SB03G013600   | sorghum  | 423               | 637               |
| LNU904    | sorghum 12v1 SB03G015670   | sorghum  | 424               | 781               |
| LNU905    | sorghum 12v1 SB03G025980   | sorghum  | 425               | 639               |
| LNU906    | sorghum 12v1 SB03G028220   | sorghum  | 426               | 782               |
| LNU907    | sorghum 12v1 SB03G029160   | sorghum  | 427               | 783               |
| LNU908    | sorghum 12v1 SB03G030720   | sorghum  | 428               | 642               |
| LNU909    | sorghum 12v1 SB03G032235   | sorghum  | 429               | 784               |
| LNU910    | sorghum 12v1 SB03G034870   | sorghum  | 430               | 644               |
| LNU911    | sorghum 12v1 SB03G035900   | sorghum  | 431               | 785               |
| LNU912    | sorghum 12v1 SB03G037390   | sorghum  | 432               | 646               |
| LNU913    | sorghum 12v1 SB03G039370   | sorghum  | 433               | 647               |
| LNU914    | sorghum 12v1 SB04G000560   | sorghum  | 434               | 648               |
| LNU915    | sorghum 12v1 SB04G000860   | sorghum  | 435               | 649               |
| LNU916    | sorghum 12v1 SB04G003110   | sorghum  | 436               | 650               |
| LNU917    | sorghum 12v1 SB04G005810   | sorghum  | 437               | 651               |
| LNU918    | sorghum 12v1 SB04G005960   | sorghum  | 438               | 652               |
| LNU919    | sorghum 12v1 SB04G008660   | sorghum  | 439               | 653               |
| LNU920    | sorghum 12v1 SB04G019220   | sorghum  | 440               | 654               |
| LNU921    | sorghum 12v1 SB04G023720   | sorghum  | 441               | 655               |

TABLE 1-continued

Identified polynucleotides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant

| Gene Name | Cluster tag                      | Organism       | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: |
|-----------|----------------------------------|----------------|-------------------|-------------------|
| LNU922    | <i>sorghum</i>  12v1 SB04G031020 | <i>sorghum</i> | 442               | 656               |
| LNU923    | <i>sorghum</i>  12v1 SB04G031630 | <i>sorghum</i> | 443               | 657               |
| LNU924    | <i>sorghum</i>  12v1 SB04G031790 | <i>sorghum</i> | 444               | 658               |
| LNU925    | <i>sorghum</i>  12v1 SB04G031980 | <i>sorghum</i> | 445               | 659               |
| LNU926    | <i>sorghum</i>  12v1 SB04G032240 | <i>sorghum</i> | 446               | 660               |
| LNU928    | <i>sorghum</i>  12v1 SB04G035530 | <i>sorghum</i> | 447               | 661               |
| LNU930    | <i>sorghum</i>  12v1 SB04G037720 | <i>sorghum</i> | 448               | 786               |
| LNU931    | <i>sorghum</i>  12v1 SB05G000570 | <i>sorghum</i> | 449               | 664               |
| LNU932    | <i>sorghum</i>  12v1 SB05G001300 | <i>sorghum</i> | 450               | 787               |
| LNU933    | <i>sorghum</i>  12v1 SB05G005230 | <i>sorghum</i> | 451               | 666               |
| LNU934    | <i>sorghum</i>  12v1 SB05G006950 | <i>sorghum</i> | 452               | 667               |
| LNU935    | <i>sorghum</i>  12v1 SB05G020340 | <i>sorghum</i> | 453               | 788               |
| LNU936    | <i>sorghum</i>  12v1 SB05G021410 | <i>sorghum</i> | 454               | 669               |
| LNU938    | <i>sorghum</i>  12v1 SB05G025900 | <i>sorghum</i> | 455               | 789               |
| LNU940    | <i>sorghum</i>  12v1 SB06G016140 | <i>sorghum</i> | 456               | 672               |
| LNU941    | <i>sorghum</i>  12v1 SB06G018480 | <i>sorghum</i> | 457               | 673               |
| LNU942    | <i>sorghum</i>  12v1 SB06G019950 | <i>sorghum</i> | 458               | 674               |
| LNU943    | <i>sorghum</i>  12v1 SB06G020900 | <i>sorghum</i> | 459               | 675               |
| LNU944    | <i>sorghum</i>  12v1 SB07G000250 | <i>sorghum</i> | 460               | 676               |
| LNU945    | <i>sorghum</i>  12v1 SB07G004040 | <i>sorghum</i> | 461               | 677               |
| LNU946    | <i>sorghum</i>  12v1 SB07G004390 | <i>sorghum</i> | 462               | 678               |
| LNU947    | <i>sorghum</i>  12v1 SB07G021870 | <i>sorghum</i> | 463               | 679               |
| LNU948    | <i>sorghum</i>  12v1 SB07G027790 | <i>sorghum</i> | 464               | 680               |
| LNU949    | <i>sorghum</i>  12v1 SB08G002580 | <i>sorghum</i> | 465               | 681               |
| LNU950    | <i>sorghum</i>  12v1 SB08G002740 | <i>sorghum</i> | 466               | 682               |
| LNU951    | <i>sorghum</i>  12v1 SB08G003140 | <i>sorghum</i> | 467               | 790               |
| LNU952    | <i>sorghum</i>  12v1 SB08G007610 | <i>sorghum</i> | 468               | 684               |
| LNU953    | <i>sorghum</i>  12v1 SB08G015020 | <i>sorghum</i> | 469               | 685               |
| LNU954    | <i>sorghum</i>  12v1 SB08G016400 | <i>sorghum</i> | 470               | 791               |
| LNU955    | <i>sorghum</i>  12v1 SB08G016530 | <i>sorghum</i> | 471               | 687               |
| LNU956    | <i>sorghum</i>  12v1 SB08G018765 | <i>sorghum</i> | 472               | 792               |
| LNU957    | <i>sorghum</i>  12v1 SB08G020600 | <i>sorghum</i> | 473               | 689               |
| LNU958    | <i>sorghum</i>  12v1 SB08G021920 | <i>sorghum</i> | 474               | 690               |
| LNU959    | <i>sorghum</i>  12v1 SB09G021265 | <i>sorghum</i> | 475               | 691               |
| LNU960    | <i>sorghum</i>  12v1 SB09G021520 | <i>sorghum</i> | 476               | 692               |
| LNU961    | <i>sorghum</i>  12v1 SB09G026930 | <i>sorghum</i> | 477               | 693               |
| LNU962    | <i>sorghum</i>  12v1 SB09G026990 | <i>sorghum</i> | 478               | 694               |
| LNU963    | <i>sorghum</i>  12v1 SB10G002960 | <i>sorghum</i> | 479               | 695               |
| LNU964    | <i>sorghum</i>  12v1 SB10G023640 | <i>sorghum</i> | 480               | 696               |
| LNU965    | <i>sorghum</i>  12v1 SB10G026450 | <i>sorghum</i> | 481               | 697               |
| LNU966    | <i>sorghum</i>  12v1 SB10G026910 | <i>sorghum</i> | 482               | 698               |
| LNU967    | <i>sorghum</i>  12v1 SB10G028680 | <i>sorghum</i> | 483               | 699               |
| LNU968    | <i>sorghum</i>  12v1 SB10G030200 | <i>sorghum</i> | 484               | 793               |
| LNU970    | soybean 11v1 GLYMA13G20220       | soybean        | 485               | 702               |
| LNU971    | tomato 11v1 AI772930             | tomato         | 486               | 703               |
| LNU972    | tomato 11v1 AI775263             | tomato         | 487               | 704               |
| LNU975    | tomato 11v1 BI422101             | tomato         | 488               | 705               |
| LNU976    | wheat 12v3 CA596628              | wheat          | 489               | 706               |
| LNU977    | wheat 12v3 CK152213              | wheat          | 490               | 794               |
| LNU760_   | brachypodium 12v1 BRADI1G02117   | brachy-        | 491               | 708               |
| H1        |                                  | podium         |                   |                   |
| LNU832_   | <i>sorghum</i>  12v1 SB03G013780 | <i>sorghum</i> | 492               | 709               |
| H2        |                                  |                |                   |                   |
| LNU834_   | <i>sorghum</i>  12v1 SB02G003380 | <i>sorghum</i> | 493               | 710               |
| H1        |                                  |                |                   |                   |
| LNU861_   | maize 10v1 CF635645              | maize          | 494               | 711               |
| H3        |                                  |                |                   |                   |
| LNU859    | <i>sorghum</i>  12v1 AW677786    | <i>sorghum</i> | 495               | —                 |

Table 1. Provided are the gene names, cluster names, organisms from which they are derived, and the sequence identifiers of the polynucleotides and polypeptide sequences. "Polyp." = polypeptide; "Polyn." = Polynucleotide.

Identification of Homologous (E.G., Orthologous)  
Sequences that Increase Nitrogen Use Efficiency,  
Fertilizer Use Efficiency, Yield, Growth Rate,  
Vigor, Biomass, Oil Content, Abiotic Stress  
Tolerance and/or Water Use Efficiency in Plants

The concepts of orthology and paralogy have recently been applied to functional characterizations and classifications on the scale of whole-genome comparisons. Orthologs and paralogs constitute two major types of homologs: The first evolved from a common ancestor by specialization, and the latter is related by duplication events. It is assumed that paralogs arising from ancient duplication events are likely to have diverged in function while true orthologs are more likely to retain identical function over evolutionary time.

To further investigate and identify putative orthologs of the genes affecting nitrogen use efficiency, fertilizer use efficiency, yield (e.g., seed yield, oil yield, biomass, grain quantity and/or quality), growth rate, vigor, biomass, oil content, abiotic stress tolerance and/or water use efficiency, all sequences were aligned using the BLAST (/Basic Local Alignment Search Tool/). Sequences sufficiently similar were tentatively grouped. These putative orthologs were further organized under a Phylogram—a branching diagram (tree) assumed to be a representation of the evolutionary relationships among the biological taxa. Putative ortholog groups were analyzed as to their agreement with the phylogram and in cases of disagreements these ortholog groups were broken accordingly. Expression data was analyzed and the EST libraries were classified using a fixed vocabulary of custom terms such as developmental stages (e.g., genes showing similar expression profile through development with up regulation at specific stage, such as at the seed filling stage) and/or plant organ (e.g., genes showing similar expression profile across their organs with up regulation at specific organs such as seed). The annotations from all the ESTs clustered to a gene were analyzed statistically by comparing their frequency in the cluster versus their abundance in the database, allowing the construction of a numeric and graphic expression profile of that gene, which is termed “digital expression”. The rationale of using these two complementary methods with methods of phenotypic association studies of QTLs, SNPs and phenotype expression correlation is based on the assumption that true orthologs are likely to retain identical function over evolutionary time. These methods provide different sets of indications on function similarities between two homologous genes, similarities in the sequence level—identical amino acids in the protein domains and similarity in expression profiles.

The search and identification of homologous genes involves the screening of sequence information available, for example, in public databases, which include but are not limited to the DNA Database of Japan (DDBJ), Genbank, and the European Molecular Biology Laboratory Nucleic Acid Sequence Database (EMBL) or versions thereof or the MIPS database. A number of different search algorithms have been developed, including but not limited to the suite of programs referred to as BLAST programs. There are five implementations of BLAST, three designed for nucleotide sequence queries (BLASTN, BLASTX, and TBLASTX) and two designed for protein sequence queries (BLASTP and TBLASTN) (Coulson, Trends in Biotechnology: 76-80, 1994; Birren et al., Genome Analysis, I: 543, 1997). Such methods involve alignment and comparison of sequences.

The BLAST algorithm calculates percent sequence identity and performs a statistical analysis of the similarity between the two sequences. The software for performing BLAST analysis is publicly available through the National Centre for Biotechnology Information. Other such software or algorithms are GAP, BESTFIT, FASTA and TFASTA. GAP uses the algorithm of Needleman and Wunsch (J. Mol. Biol. 48: 443-453, 1970) to find the alignment of two complete sequences that maximizes the number of matches and minimizes the number of gaps.

The homologous genes may belong to the same gene family. The analysis of a gene family may be carried out using sequence similarity analysis. To perform this analysis one may use standard programs for multiple alignments e.g. Clustal W. A neighbor-joining tree of the proteins homologous to the genes of some embodiments of the invention may be used to provide an overview of structural and ancestral relationships. Sequence identity may be calculated using an alignment program as described above. It is expected that other plants will carry a similar functional gene (orthologue) or a family of similar genes and those genes will provide the same preferred phenotype as the genes presented here. Advantageously, these family members may be useful in the methods of some embodiments of the invention. Example of other plants include, but not limited to, barley (*Hordeum vulgare*), *Arabidopsis* (*Arabidopsis thaliana*), maize (*Zea mays*), cotton (*Gossypium*), Oilseed rape (*Brassica napus*), Rice (*Oryza sativa*), Sugar cane (*Saccharum officinarum*), *Sorghum* (*Sorghum bicolor*), Soybean (*Glycine max*), Sunflower (*Helianthus annuus*), Tomato (*Lycopersicon esculentum*) and Wheat (*Triticum aestivum*).

The above-mentioned analyses for sequence homology is preferably carried out on a full-length sequence, but may also be based on a comparison of certain regions such as conserved domains. The identification of such domains would also be well within the realm of the person skilled in the art and would involve, for example, a computer readable format of the nucleic acids of some embodiments of the invention, the use of alignment software programs and the use of publicly available information on protein domains, conserved motifs and boxes. This information is available in the PRODOM (biochem (dot) ucl (dot) ac (dot) uk/bsm/dbbrowser/protocol/prodomqry (dot) html), PIR (pir (dot) Georgetown (dot) edu/) or Pfam (sanger (dot) ac (dot) uk/Software/Pfam/) database. Sequence analysis programs designed for motif searching may be used for identification of fragments, regions and conserved domains as mentioned above. Preferred computer programs include, but are not limited to, MEME, SIGNALSCAN, and GENESCAN.

A person skilled in the art may use the homologous sequences provided herein to find similar sequences in other species and other organisms. Homologues of a protein encompass, peptides, oligopeptides, polypeptides, proteins and enzymes having amino acid substitutions, deletions and/or insertions relative to the unmodified protein in question and having similar biological and functional activity as the unmodified protein from which they are derived. To produce such homologues, amino acids of the protein may be replaced by other amino acids having similar properties (conservative changes, such as similar hydrophobicity, hydrophilicity, antigenicity, propensity to form or break a-helical structures or 3-sheet structures). Conservative substitution Tables are well known in the art [see for example Creighton (1984) Proteins. W.H. Freeman and Company]. Homologues of a nucleic acid encompass nucleic acids having nucleotide substitutions, deletions and/or insertions

relative to the unmodified nucleic acid in question and having similar biological and functional activity as the unmodified nucleic acid from which they are derived.

Polynucleotides and polypeptides with significant homology to the identified genes described in Table 1 (Example 1 above) were identified from the databases using BLAST software with the Blastp and tBlastn algorithms as filters for the first stage, and the needle (EMBOSS package) or Frame+ algorithm alignment for the second stage. Local identity (Blast alignments) was defined with a very permissive cutoff—60% Identity on a span of 60% of the sequences lengths because it is used only as a filter for the global alignment stage. The default filtering of the Blast package was not utilized (by setting the parameter “-F F”).

In the second stage, homologs were defined based on a global identity of at least 80% to the core gene polypeptide sequence.

Two distinct forms for finding the optimal global alignment for protein or nucleotide sequences were used in this application:

1. Between Two Proteins (Following the Blastp Filter): EMBOSS-6.0.1 Needleman-Wunsch algorithm with

the following modified parameters: gapopen=8 gapextend=2. The rest of the parameters were unchanged from the default options described hereinabove.

2. Between a Protein Sequence and a Nucleotide Sequence (Following the tblastn Filter): GenCore 6.0 OneModel application utilizing the Frame+ algorithm with the following parameters: model=frame+\_p2n.model mode=qglobal -q=protein.sequence -db=nucleotide.sequence. The rest of the parameters are unchanged from the default options described hereinabove.

The query polypeptide sequences were SEQ ID NOs: 496-794 and the query polynucleotides were SEQ ID NOs: 1-495, and the identified orthologous and homologous sequences having at least 80% global sequence identity are provided in Table 2, below. These homologous genes are expected to increase plant yield, seed yield, oil yield, oil content, growth rate, fiber yield, fiber quality, fiber length, photosynthetic capacity, biomass, vigor, ABST and/or NUE of a plant.

TABLE 2

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU751_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA652300                  | 795               | 2898              | 498                | 89.1 globlastp       |
| LNU751_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.339395            | 796               | 2899              | 498                | 88.45 globlastn      |
| LNU752_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.155230            | 797               | 2900              | 499                | 96.4 globlastp       |
| LNU752_H4                                                                                                                                                                                                                                                                                                     | oat 11v1 GR316906_P1                 | 798               | 2901              | 499                | 90.7 globlastp       |
| LNU752_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G38247_P1    | 799               | 2902              | 499                | 88.4 globlastp       |
| LNU752_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.244869            | 800               | 2903              | 499                | 84.8 globlastp       |
| LNU753_H1                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF341151       | 801               | 2904              | 500                | 96.4 globlastp       |
| LNU753_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA619061                  | 802               | 2905              | 500                | 95.5 globlastp       |
| LNU753_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001013.175630            | 803               | 2906              | 500                | 93.7 globlastp       |
| LNU753_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G76060_T1    | 804               | 2907              | 500                | 90.6 globlastn       |
| LNU753_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 GFXAC099399X6              | 805               | 2908              | 500                | 87 globlastp         |
| LNU753_H6                                                                                                                                                                                                                                                                                                     | barley 12v1 BE060847_P1              | 806               | 2909              | 500                | 80.3 globlastp       |
| LNU753_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BF474874                  | 807               | 2910              | 500                | 80.3 globlastp       |
| LNU753_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 BM037785                   | 808               | 2911              | 500                | 80 globlastp         |
| LNU754_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE413658                  | 809               | 2912              | 501                | 95.8 globlastp       |
| LNU754_H2                                                                                                                                                                                                                                                                                                     | leymus gb166 EG390263_P1             | 810               | 2913              | 501                | 95 globlastp         |
| LNU754_H3                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF349286       | 811               | 2914              | 501                | 95 globlastp         |
| LNU754_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.101669            | 812               | 2915              | 501                | 95 globlastp         |
| LNU754_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G06900_P1    | 813               | 2916              | 501                | 91.2 globlastp       |
| LNU754_H6                                                                                                                                                                                                                                                                                                     | oat 11v1 GR365468_P1                 | 814               | 2917              | 501                | 88.7 globlastp       |
| LNU754_H7                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB03G001930             | 815               | 2918              | 501                | 85.4 globlastp       |
| LNU754_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM027276_P1        | 816               | 2919              | 501                | 84.1 globlastp       |
| LNU754_H9                                                                                                                                                                                                                                                                                                     | maize 10v1 A1600590_P1               | 817               | 2920              | 501                | 83.9 globlastp       |
| LNU754_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE624722_P1         | 818               | 2921              | 501                | 83.7 globlastp       |
| LNU754_H10                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI002752M_P1 | 819               | 2922              | 501                | 83.3 globlastp       |
| LNU754_H11                                                                                                                                                                                                                                                                                                    | rice 11v1 BE228738                   | 820               | 2923              | 501                | 82 globlastp         |
| LNU754_H12                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE624722           | 821               | 2924              | 501                | 82 globlastp         |
| LNU756_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.433563            | 822               | 2925              | 502                | 94.9 globlastp       |
| LNU756_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 BE493902                    | 823               | 2926              | 502                | 94.6 globlastp       |
| LNU756_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.24867             | 824               | 2926              | 502                | 94.6 globlastp       |
| LNU756_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 BG606914                  | 825               | 2927              | 502                | 94.6 globlastp       |
| LNU756_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G24030_P1    | 826               | 2928              | 502                | 93.5 globlastp       |
| LNU756_H6                                                                                                                                                                                                                                                                                                     | oat 11v1 GR329669_P1                 | 827               | 2929              | 502                | 92.4 globlastp       |
| LNU756_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 BF475232                   | 828               | 2930              | 502                | 82.61 globlastn      |
| LNU756_H8                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612148_P1      | 829               | 2931              | 502                | 81.5 globlastp       |
| LNU756_H9                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 BU103174              | 830               | 2932              | 502                | 80.4 globlastp       |
| LNU756_H10                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB09G021710             | 831               | 2933              | 502                | 80.1 globlastp       |
| LNU756_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN150091_P1         | 832               | 2934              | 502                | 80 globlastp         |
| LNU756_H11                                                                                                                                                                                                                                                                                                    | switchgrass gb167 DN150091           | 833               | 2934              | 502                | 80 globlastp         |
| LNU757_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA645023                  | 834               | 2935              | 503                | 98.2 globlastp       |
| LNU757_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.10473             | 835               | 2936              | 503                | 97 globlastp         |
| LNU757_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.121839            | 836               | 2937              | 503                | 97 globlastp         |
| LNU757_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.768638            | 837               | 2938              | 503                | 95.9 globlastp       |
| LNU757_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE426208                  | 838               | 2939              | 503                | 93.5 globlastp       |
| LNU757_H6                                                                                                                                                                                                                                                                                                     | oat 11v1 GR328666_P1                 | 839               | 2940              | 503                | 91.8 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU758_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BG906982                  | 840               | 2941              | 504                | 91.6          | globlastp |
| LNU758_H2                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF345629       | 841               | 2942              | 504                | 87.1          | globlastp |
| LNU759_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.140285            | 842               | 2943              | 505                | 94            | globlastp |
| LNU759_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA742547                  | 843               | 2944              | 505                | 93            | globlastp |
| LNU759_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR043326X66986D1         | 844               | 2944              | 505                | 93            | globlastp |
| LNU759_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI023760M_P1 | 845               | 2945              | 505                | 90            | globlastp |
| LNU759_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 CF293997                   | 846               | 2946              | 505                | 87.4          | globlastp |
| LNU759_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL787656_P1         | 847               | 2947              | 505                | 87            | globlastp |
| LNU759_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL787656           | 848               | 2947              | 505                | 87            | globlastp |
| LNU759_H7                                                                                                                                                                                                                                                                                                     | cynodon 10v1 ES299636_P1             | 849               | 2948              | 505                | 86.1          | globlastp |
| LNU759_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL779827_P1         | 850               | 2949              | 505                | 86            | globlastp |
| LNU759_H8                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB09G022720             | 851               | 2950              | 505                | 83.5          | globlastp |
| LNU759_H9                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G23060_P1    | 852               | 2951              | 505                | 82.2          | globlastp |
| LNU759_H10                                                                                                                                                                                                                                                                                                    | maize 10v1 EE680335_P1               | 853               | 2952              | 505                | 82            | globlastp |
| LNU760_H2                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF358412       | 854               | 2953              | 506                | 86.75         | globlastn |
| LNU760_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001014.135934            | 855               | 2954              | 506                | 81.13         | globlastn |
| LNU760_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL773680_T1         | 856               | 2955              | 506                | 80.13         | globlastn |
| LNU761_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BQ170294                  | 857               | 2956              | 507                | 96.1          | globlastp |
| LNU761_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 BG263661                  | 858               | 2957              | 507                | 95.3          | globlastp |
| LNU761_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 BF429268                    | 859               | 2958              | 507                | 95.1          | globlastp |
| LNU761_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G61140_P1    | 860               | 2959              | 507                | 84.7          | globlastp |
| LNU761_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI001000M_P1 | 861               | 2960              | 507                | 84.5          | globlastp |
| LNU761_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE627078_P1         | 862               | 2961              | 507                | 83.8          | globlastp |
| LNU761_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE605627           | 863               | 2962              | 507                | 82.8          | globlastp |
| LNU761_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 CR278964                   | 864               | 2963              | 507                | 82.6          | globlastp |
| LNU761_H8                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB03G046200             | 865               | 2964              | 507                | 81.2          | globlastp |
| LNU762_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.142840            | 866               | 2965              | 508                | 93.9          | globlastp |
| LNU762_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.108084            | 867               | 2966              | 508                | 93.6          | globlastp |
| LNU762_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA653618                  | 868               | 2967              | 508                | 92.5          | globlastp |
| LNU762_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI5G07300_P1    | 869               | 2968              | 508                | 87.1          | globlastp |
| LNU762_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613160_P1      | 870               | 2969              | 508                | 81            | globlastp |
| LNU763_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE517537                  | 871               | 2970              | 509                | 93.3          | globlastp |
| LNU763_H2                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF345576       | 872               | 2971              | 509                | 91.3          | globlastp |
| LNU763_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.538230            | 873               | 2972              | 509                | 89.7          | globlastp |
| LNU763_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.104458            | 874               | 2973              | 509                | 89.1          | globlastp |
| LNU763_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.104992            | 875               | 2974              | 509                | 89.1          | globlastp |
| LNU763_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.307746            | 876               | 2975              | 509                | 89.1          | globlastn |
| LNU763_H7                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.403113            | 877               | 2976              | 509                | 86.58         | globlastn |
| LNU764_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE419722                  | 878               | 2977              | 510                | 96            | globlastp |
| LNU764_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.148705            | 879               | 2978              | 510                | 95.6          | globlastp |
| LNU764_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 AL817877                  | 880               | 2979              | 510                | 94.8          | globlastp |
| LNU764_H4                                                                                                                                                                                                                                                                                                     | rice 11v1 CB680462                   | 881               | 2980              | 510                | 83.8          | globlastp |
| LNU764_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G14080_P1    | 882               | 2981              | 510                | 83.6          | globlastp |
| LNU764_H6                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB07G002140             | 883               | 2982              | 510                | 82.4          | globlastp |
| LNU764_H7                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613412_P1      | 884               | 2983              | 510                | 81.3          | globlastp |
| LNU764_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE638335_P1         | 885               | 2984              | 510                | 80.9          | globlastp |
| LNU764_H8                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE649051           | 886               | 2985              | 510                | 80.57         | globlastn |
| LNU764_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL754424_P1         | 887               | 2986              | 510                | 80.3          | globlastp |
| LNU766_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BF483178                  | 888               | 2987              | 511                | 96.6          | globlastp |
| LNU766_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.107386            | 889               | 2988              | 511                | 96.14         | globlastn |
| LNU766_H3                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G62060_T1    | 890               | 2989              | 511                | 90.68         | globlastn |
| LNU766_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 BM419326                   | 891               | 2990              | 511                | 85.8          | globlastp |
| LNU766_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 GT090868_P1      | 892               | 2991              | 511                | 85.5          | globlastp |
| LNU766_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DT948944_P1         | 893               | 2992              | 511                | 85.4          | globlastp |
| LNU766_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE657698_P1         | 894               | 2993              | 511                | 85.3          | globlastp |
| LNU766_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM004168_P1        | 895               | 2994              | 511                | 84.9          | globlastp |
| LNU766_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.124126            | 896               | 2995              | 511                | 84.7          | globlastp |
| LNU766_H9                                                                                                                                                                                                                                                                                                     | maize 10v1 BM259345_P1               | 897               | 2996              | 511                | 84.5          | globlastp |
| LNU766_H10                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB10G025840             | 898               | 2997              | 511                | 84.4          | globlastp |
| LNU767_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.555545            | 899               | 2998              | 512                | 92.3          | globlastp |
| LNU767_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE419870                  | 900               | 2999              | 512                | 91.2          | globlastp |
| LNU767_H3                                                                                                                                                                                                                                                                                                     | lolum 10v1 AU246334_P1               | 901               | 3000              | 512                | 84.6          | globlastp |
| LNU768_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BI479814                  | 902               | 3001              | 513                | 99.1          | globlastp |
| LNU768_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001013.174965            | 903               | 3002              | 513                | 98.2          | globlastp |
| LNU768_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.20806             | 904               | 3003              | 513                | 97.8          | globlastp |
| LNU768_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.266041            | 905               | 3004              | 513                | 97.35         | globlastn |
| LNU768_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G56682_P1    | 906               | 3005              | 513                | 93.4          | globlastp |
| LNU768_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 CF294088                   | 907               | 3006              | 513                | 93.4          | globlastp |
| LNU768_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL692202_P1         | 908               | 3007              | 513                | 92.5          | globlastp |
| LNU768_H7                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G021690             | 909               | 3008              | 513                | 92.5          | globlastp |
| LNU768_H8                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL692202           | 910               | 3007              | 513                | 92.5          | globlastp |
| LNU768_H9                                                                                                                                                                                                                                                                                                     | maize 10v1 AI941829_P1               | 911               | 3009              | 513                | 92            | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU768_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 GD014223_P1         | 912               | 3010              | 513                | 91.2          | globlastp |
| LNU768_H10                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI034560M_T1 | 913               | 3011              | 513                | 90.35         | globlastn |
| LNU768_H11                                                                                                                                                                                                                                                                                                    | sugarcane 10v1 BQ536826              | 914               | 3012              | 513                | 90.3          | globlastp |
| LNU768_H12                                                                                                                                                                                                                                                                                                    | oat 11v1 GO596074_P1                 | 915               | 3013              | 513                | 84.5          | globlastp |
| LNU768_H13                                                                                                                                                                                                                                                                                                    | amborella 12v3 SRR038634.15775_P1    | 916               | 3014              | 513                | 80.1          | globlastp |
| LNU768_H14                                                                                                                                                                                                                                                                                                    | pineapple 10v1 DT336500_P1           | 917               | 3015              | 513                | 80.1          | globlastp |
| LNU769_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G21820_P1    | 918               | 3016              | 514                | 82.4          | globlastp |
| LNU769_H13                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI2G16170_P1    | 919               | 3017              | 514                | 80.8          | globlastp |
| LNU769_H14                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB05G007470             | 920               | 3018              | 514                | 80.8          | globlastp |
| LNU770_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE398561                  | 921               | 3019              | 515                | 96            | globlastp |
| LNU770_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.142789            | 922               | 3020              | 515                | 94.8          | globlastp |
| LNU770_H3                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G56870_P1    | 923               | 3021              | 515                | 82            | globlastp |
| LNU772_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BM135473                  | 924               | 3022              | 517                | 96            | globlastp |
| LNU772_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.142915            | 925               | 3023              | 517                | 93.5          | globlastp |
| LNU772_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.612512            | 926               | 3024              | 517                | 93            | globlastp |
| LNU772_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G08480_P1    | 927               | 3025              | 517                | 90.5          | globlastp |
| LNU772_H5                                                                                                                                                                                                                                                                                                     | oat 11v1 GO592678_P1                 | 928               | 3026              | 517                | 88.9          | globlastp |
| LNU772_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM022643_P1        | 929               | 3027              | 517                | 86.6          | globlastp |
| LNU772_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 CB000951                   | 930               | 3028              | 517                | 86.3          | globlastp |
| LNU772_H9                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI018070M_P1 | 931               | 3029              | 517                | 86            | globlastp |
| LNU772_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN144396_P1         | 932               | 3030              | 517                | 84.3          | globlastp |
| LNU772_H13                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB04G008000             | 933               | 3031              | 517                | 83.9          | globlastp |
| LNU772_H10                                                                                                                                                                                                                                                                                                    | switchgrass gb167 DN144396           | 934               | 3032              | 517                | 83.8          | globlastp |
| LNU772_H11                                                                                                                                                                                                                                                                                                    | maize 10v1 AA979978_P1               | 935               | 3033              | 517                | 83.7          | globlastp |
| LNU772_H14                                                                                                                                                                                                                                                                                                    | cynodon 10v1 ES292031_P1             | 936               | 3034              | 517                | 82.1          | globlastp |
| LNU773_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.115164            | 937               | 3035              | 518                | 94.6          | globlastp |
| LNU773_H2                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G02440_P1    | 938               | 3036              | 518                | 84.1          | globlastp |
| LNU773_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034229M_P1 | 939               | 3037              | 518                | 82.1          | globlastp |
| LNU773_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 SICRP053164_P1   | 940               | 3037              | 518                | 82.1          | globlastp |
| LNU773_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 CB634493                   | 941               | 3038              | 518                | 81.5          | globlastp |
| LNU774_H1                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G38810_P1    | 942               | 3039              | 519                | 82.9          | globlastp |
| LNU775_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.110859            | 943               | 3040              | 520                | 93.5          | globlastp |
| LNU775_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 CD937862                  | 944               | 3041              | 520                | 82.8          | globlastp |
| LNU775_H3                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G04447_P1    | 945               | 3042              | 520                | 82.6          | globlastp |
| LNU777_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.142992            | 946               | 3043              | 522                | 92.4          | globlastp |
| LNU777_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.313229            | 947               | 3044              | 522                | 91.8          | globlastp |
| LNU777_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE499027                  | 948               | 3045              | 522                | 81.89         | globlastn |
| LNU778_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE402486                  | 949               | 3046              | 523                | 96.9          | globlastp |
| LNU778_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR073321X42757D1         | 950               | 3047              | 523                | 96.9          | globlastp |
| LNU778_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 CD871315                  | 951               | 3048              | 523                | 91.7          | globlastp |
| LNU778_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G46340_P1    | 952               | 3049              | 523                | 91.6          | globlastp |
| LNU778_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 BI811994                   | 953               | 3050              | 523                | 87.2          | globlastp |
| LNU778_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI000364M_P1 | 954               | 3051              | 523                | 85.2          | globlastp |
| LNU778_H7                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB03G030890             | 955               | 3052              | 523                | 85.1          | globlastp |
| LNU778_H8                                                                                                                                                                                                                                                                                                     | maize 10v1 CA399726_P1               | 956               | 3053              | 523                | 84.5          | globlastp |
| LNU778_H9                                                                                                                                                                                                                                                                                                     | maize 10v1 AI615203_T1               | 957               | 3054              | 523                | 83.35         | globlastn |
| LNU779_H1                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF346373       | 958               | 3055              | 524                | 98.1          | globlastp |
| LNU779_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 BE587009                    | 959               | 3056              | 524                | 97.8          | globlastp |
| LNU779_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE402818                  | 960               | 3057              | 524                | 97.5          | globlastp |
| LNU779_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE586120                  | 961               | 3058              | 524                | 97.5          | globlastp |
| LNU779_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 CV778626                  | 962               | 3059              | 524                | 96.91         | globlastn |
| LNU779_H6                                                                                                                                                                                                                                                                                                     | oat 11v1 CN815634_T1                 | 963               | 3060              | 524                | 94.44         | globlastn |
| LNU779_H7                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G42790_P1    | 964               | 3061              | 524                | 91.7          | globlastp |
| LNU779_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 BI794901                   | 965               | 3062              | 524                | 88.6          | globlastp |
| LNU779_H9                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI014086M_P1 | 966               | 3063              | 524                | 87.7          | globlastp |
| LNU779_H10                                                                                                                                                                                                                                                                                                    | switchgrass gb167 DN144658           | 967               | 3064              | 524                | 87.7          | globlastp |
| LNU779_H11                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE631532           | 968               | 3065              | 524                | 87.7          | globlastp |
| LNU779_H12                                                                                                                                                                                                                                                                                                    | millet 10v1 EVO454PM012215_P1        | 969               | 3066              | 524                | 87.4          | globlastp |
| LNU779_H13                                                                                                                                                                                                                                                                                                    | maize 10v1 AI649552_P1               | 970               | 3067              | 524                | 86.8          | globlastp |
| LNU779_H14                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB07G024220             | 971               | 3068              | 524                | 86.8          | globlastp |
| LNU779_H15                                                                                                                                                                                                                                                                                                    | sugarcane 10v1 CA065962              | 972               | 3069              | 524                | 86.8          | globlastp |
| LNU779_H16                                                                                                                                                                                                                                                                                                    | maize 10v1 BG354183_P1               | 973               | 3070              | 524                | 83.7          | globlastp |
| LNU779_H17                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE639284_P1         | 974               | 3071              | 524                | 81.8          | globlastp |
| LNU781_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.110372            | 975               | 3072              | 526                | 98.9          | globlastp |
| LNU781_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.15876             | 976               | 3073              | 526                | 97.11         | globlastn |
| LNU781_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA666142                  | 977               | 3074              | 526                | 96.1          | globlastp |
| LNU781_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G07870_P1    | 978               | 3075              | 526                | 91.3          | globlastp |
| LNU781_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612060_P1      | 979               | 3076              | 526                | 84.2          | globlastp |
| LNU781_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 BI118738                   | 980               | 3077              | 526                | 84            | globlastp |
| LNU781_H7                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G007340             | 981               | 3078              | 526                | 83.7          | globlastp |
| LNU781_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM114571_P1        | 982               | 3079              | 526                | 82.4          | globlastp |
| LNU781_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL756770_P1         | 983               | 3080              | 526                | 82.2          | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU781_H9                                                                                                                                                                                                                                                                                                     | maize 10v1 CA403670_P1               | 984               | 3081              | 526                | 82.2 globlastp       |
| LNU781_H10                                                                                                                                                                                                                                                                                                    | wheat 12v3 CA593786                  | 985               | 3082              | 526                | 81.84 globlastn      |
| LNU781_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE611031_P1         | 986               | 3083              | 526                | 80.8 globlastp       |
| LNU781_H11                                                                                                                                                                                                                                                                                                    | maize 10v1 BM498386_P1               | 987               | 3084              | 526                | 80.3 globlastp       |
| LNU782_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BQ788965                  | 988               | 3085              | 527                | 97.9 globlastp       |
| LNU782_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.594129            | 989               | 3086              | 527                | 96.2 globlastp       |
| LNU783_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.216554            | 990               | 3087              | 528                | 92.8 globlastp       |
| LNU783_H2                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G04360_P1    | 991               | 3088              | 528                | 81.8 globlastp       |
| LNU783_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 BE040181                   | 992               | 3089              | 528                | 80 globlastp         |
| LNU787_H12                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.395832            | 993               | 3090              | 532                | 91.4 globlastp       |
| LNU787_H13                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.20638             | 994               | 3091              | 532                | 90.8 globlastp       |
| LNU787_H1                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF355972       | 995               | 3092              | 532                | 90.5 globlastp       |
| LNU787_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 BG909595                  | 996               | 3093              | 532                | 89.9 globlastp       |
| LNU787_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 AL821420                  | 997               | —                 | 532                | 89.63 globlastn      |
| LNU787_H9                                                                                                                                                                                                                                                                                                     | rice 11v1 AU092213                   | 998               | 3094              | 532                | 87.7 globlastp       |
| LNU787_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 GD010772           | 999               | 3095              | 532                | 86.5 globlastp       |
| LNU787_H8                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI006894M_P1 | 1000              | 3096              | 532                | 86.5 globlastp       |
| LNU787_H14                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 GD010772_P1         | 1001              | 3097              | 532                | 86.2 globlastp       |
| LNU787_H7                                                                                                                                                                                                                                                                                                     | cenchrus gb166 EB661125_P1           | 1002              | 3098              | 532                | 86.2 globlastp       |
| LNU787_H10                                                                                                                                                                                                                                                                                                    | millet 10v1 EVO454PM055809_T1        | 1003              | —                 | 532                | 84.97 globlastn      |
| LNU787_H3                                                                                                                                                                                                                                                                                                     | leymus gb166 EG384638_P1             | 1004              | 3099              | 532                | 84.7 globlastp       |
| LNU787_H11                                                                                                                                                                                                                                                                                                    | maize 10v1 AI670300_P1               | 1005              | 3100              | 532                | 83.7 globlastp       |
| LNU788_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.407094            | 1006              | 3101              | 533                | 91.4 globlastp       |
| LNU788_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.189907            | 1007              | 3102              | 533                | 91.1 globlastp       |
| LNU788_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE606973                  | 1008              | 3103              | 533                | 90.7 globlastp       |
| LNU788_H5                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB10G003000             | 1009              | 3104              | 533                | 83.3 globlastp       |
| LNU789_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BJ312717                  | 1010              | 3105              | 534                | 93.65 globlastn      |
| LNU789_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 CD898702                  | 1011              | 3106              | 534                | 91.8 globlastp       |
| LNU789_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.152256            | 1012              | 3107              | 534                | 91.7 globlastp       |
| LNU789_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 AL821622                  | 1013              | 3108              | 534                | 91.1 globlastp       |
| LNU789_H5                                                                                                                                                                                                                                                                                                     | barley 12v1 BG344287_P1              | 1014              | 3109              | 534                | 90.2 globlastp       |
| LNU789_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034969M_P1 | 1015              | 3110              | 534                | 89.2 globlastp       |
| LNU789_H7                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL695828           | 1016              | 3111              | 534                | 88.6 globlastp       |
| LNU789_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM015227_P1        | 1017              | 3112              | 534                | 87 globlastp         |
| LNU789_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL695828_P1         | 1018              | 3113              | 534                | 86.8 globlastp       |
| LNU789_H9                                                                                                                                                                                                                                                                                                     | rice 11v1 C27096                     | 1019              | 3114              | 534                | 86.8 globlastp       |
| LNU789_H10                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB01G037160             | 1020              | 3115              | 534                | 86.1 globlastp       |
| LNU789_H11                                                                                                                                                                                                                                                                                                    | maize 10v1 AI783213_P1               | 1021              | 3116              | 534                | 85.9 globlastp       |
| LNU789_H12                                                                                                                                                                                                                                                                                                    | sugarcane 10v1 CA066166              | 1022              | 3117              | 534                | 85.6 globlastp       |
| LNU790_H1                                                                                                                                                                                                                                                                                                     | rice 11v1 BI804641                   | 1023              | 3118              | 535                | 90.8 globlastp       |
| LNU790_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI461507_P1               | 1024              | 3119              | 535                | 90.4 globlastp       |
| LNU790_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G038000             | 1025              | 3120              | 535                | 90.4 globlastp       |
| LNU790_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE603656_P1         | 1026              | 3121              | 535                | 90.2 globlastp       |
| LNU790_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 BI096427_P1               | 1027              | 3122              | 535                | 90 globlastp         |
| LNU790_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI035653M_P1 | 1028              | 3123              | 535                | 89.6 globlastp       |
| LNU790_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.151815            | 1029              | 3124              | 535                | 88.6 globlastp       |
| LNU790_H7                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN142553           | 1030              | 3125              | 535                | 88.52 globlastn      |
| LNU790_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM083041_P1        | 1031              | 3126              | 535                | 86.5 globlastp       |
| LNU790_H9                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA605241                  | 1032              | 3127              | 535                | 82.3 globlastp       |
| LNU791_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G041890             | 1033              | 3128              | 536                | 89.6 globlastp       |
| LNU791_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 ERR125558X24074D1         | 1034              | 3129              | 536                | 89.6 globlastp       |
| LNU791_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.416966            | 1035              | 3130              | 536                | 88.7 globlastp       |
| LNU791_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI038156M_P1 | 1036              | 3131              | 536                | 85.8 globlastp       |
| LNU791_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 CA752611                   | 1037              | 3132              | 536                | 85.8 globlastp       |
| LNU791_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL973644           | 1038              | 3133              | 536                | 85.8 globlastp       |
| LNU791_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 PMSLX0872180D1_P1        | 1039              | 3134              | 536                | 84.9 globlastp       |
| LNU792_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 GFXFJ374582X1               | 1040              | 3135              | 537                | 94 globlastp         |
| LNU792_H2                                                                                                                                                                                                                                                                                                     | barley 12v1 AV833692_P1              | 1041              | 3136              | 537                | 93.6 globlastp       |
| LNU792_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 AU056540                   | 1042              | 3137              | 537                | 89.9 globlastp       |
| LNU792_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI000485M_P1 | 1043              | 3138              | 537                | 88.7 globlastp       |
| LNU792_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE640305_P1         | 1044              | 3139              | 537                | 88.3 globlastp       |
| LNU792_H5                                                                                                                                                                                                                                                                                                     | maize 10v1 AW600616_P1               | 1045              | 3140              | 537                | 87.7 globlastp       |
| LNU792_H6                                                                                                                                                                                                                                                                                                     | maize 10v1 CD439418_P1               | 1046              | 3141              | 537                | 84.7 globlastp       |
| LNU792_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE412277                  | 1047              | 3142              | 537                | 82.4 globlastp       |
| LNU792_H8                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB03G036050             | 1048              | 3143              | 537                | 82.3 globlastp       |
| LNU792_H9                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA614780                  | 1049              | 3144              | 537                | 80 globlastp         |
| LNU794_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BF201200                  | 1050              | 3145              | 539                | 96.7 globlastp       |
| LNU794_H2                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF344480       | 1051              | 3146              | 539                | 96.3 globlastp       |
| LNU794_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.108384            | 1052              | 3147              | 539                | 96.3 globlastp       |
| LNU794_H4                                                                                                                                                                                                                                                                                                     | oat 11v1 GO588032_P1                 | 1053              | 3148              | 539                | 95.5 globlastp       |
| LNU794_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 AF074750                   | 1054              | 3149              | 539                | 89.8 globlastp       |
| LNU794_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE601825_P1         | 1055              | 3150              | 539                | 88.5 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                       |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                  | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU794_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE601825            | 1056              | 3150              | 539                | 88.5          | globlastp |
| LNU794_H7                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE644897            | 1057              | 3151              | 539                | 88.1          | globlastp |
| LNU794_H8                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA102960               | 1058              | 3152              | 539                | 87.7          | globlastp |
| LNU794_H9                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM002886_P1         | 1059              | 3153              | 539                | 87.3          | globlastp |
| LNU794_H10                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI014266M_P1  | 1060              | 3154              | 539                | 86.5          | globlastp |
| LNU794_H11                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB07G003760              | 1061              | 3155              | 539                | 86.5          | globlastp |
| LNU794_H12                                                                                                                                                                                                                                                                                                    | maize 10v1 AI944207_P1                | 1062              | 3156              | 539                | 84.8          | globlastp |
| LNU794_H14                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL968985_T1          | 1063              | 3157              | 539                | 80            | globlastn |
| LNU797_H1                                                                                                                                                                                                                                                                                                     | leymus gb166 EG376487_P1              | 1064              | 3158              | 542                | 99.6          | globlastp |
| LNU797_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE400744                   | 1065              | 3159              | 542                | 99.2          | globlastp |
| LNU797_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE406331                   | 1066              | 3160              | 542                | 99.2          | globlastp |
| LNU797_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA730405                   | 1067              | 3159              | 542                | 99.2          | globlastp |
| LNU797_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 BF429235                     | 1068              | 3161              | 542                | 98.7          | globlastp |
| LNU797_H6                                                                                                                                                                                                                                                                                                     | fescue gb161 CK801981_P1              | 1069              | 3162              | 542                | 98.3          | globlastp |
| LNU797_H7                                                                                                                                                                                                                                                                                                     | oat 11v1 CN816314_P1                  | 1070              | 3163              | 542                | 98.3          | globlastp |
| LNU797_H8                                                                                                                                                                                                                                                                                                     | oat 11v1 GO589763_P1                  | 1071              | 3164              | 542                | 97.9          | globlastp |
| LNU797_H9                                                                                                                                                                                                                                                                                                     | rice 11v1 BE039235                    | 1072              | 3165              | 542                | 97.9          | globlastp |
| LGP52                                                                                                                                                                                                                                                                                                         | sorghum 12v1 SB05G024560              | 1073              | 3166              | 542                | 97.5          | globlastp |
| LNU797_H10                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI4G13740T2_P1   | 1074              | 3167              | 542                | 97.5          | globlastp |
| LNU797_H11                                                                                                                                                                                                                                                                                                    | maize 10v1 AI395988_P1                | 1075              | 3166              | 542                | 97.5          | globlastp |
| LNU797_H12                                                                                                                                                                                                                                                                                                    | sugarcane 10v1 BQ536939               | 1076              | 3166              | 542                | 97.5          | globlastp |
| LNU797_H13                                                                                                                                                                                                                                                                                                    | cenchrus gb166 BM084421_P1            | 1077              | 3168              | 542                | 97            | globlastp |
| LNU797_H14                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI026806M_P1  | 1078              | 3168              | 542                | 97            | globlastp |
| LNU797_H15                                                                                                                                                                                                                                                                                                    | onion 12v1 CF439938_P1                | 1079              | 3169              | 542                | 97            | globlastp |
| LNU797_H16                                                                                                                                                                                                                                                                                                    | onion 12v1 CF441222_P1                | 1080              | 3170              | 542                | 97            | globlastp |
| LNU797_H17                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB01G046910              | 1081              | 3171              | 542                | 97            | globlastp |
| LGP52_H1                                                                                                                                                                                                                                                                                                      | switchgrass 12v1 FE602145_P1          | 1082              | 3172              | 542                | 96.6          | globlastp |
| LNU797_H18                                                                                                                                                                                                                                                                                                    | euonymus 11v1 SRR070038X135997_P1     | 1083              | 3173              | 542                | 96.6          | globlastp |
| LNU797_H19                                                                                                                                                                                                                                                                                                    | fescue gb161 DT675202_P1              | 1084              | 3174              | 542                | 96.6          | globlastp |
| LNU797_H20                                                                                                                                                                                                                                                                                                    | maize 10v1 AI714766_P1                | 1085              | 3175              | 542                | 96.6          | globlastp |
| LNU797_H21                                                                                                                                                                                                                                                                                                    | millet 10v1 EVO454PM001587_P1         | 1086              | 3176              | 542                | 96.6          | globlastp |
| LNU797_H22                                                                                                                                                                                                                                                                                                    | millet 10v1 EVO454PM005709_P1         | 1087              | 3177              | 542                | 96.6          | globlastp |
| LNU797_H23                                                                                                                                                                                                                                                                                                    | pseudoroegneria gb167 FF343070        | 1088              | 3178              | 542                | 96.6          | globlastp |
| LNU797_H24                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.101136             | 1089              | 3178              | 542                | 96.6          | globlastp |
| LNU797_H25                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.112514             | 1090              | 3178              | 542                | 96.6          | globlastp |
| LNU797_H26                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.193069             | 1091              | 3178              | 542                | 96.6          | globlastp |
| LNU797_H27                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE602145            | 1092              | 3172              | 542                | 96.6          | globlastp |
| LNU797_H28                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE619094            | 1093              | 3172              | 542                | 96.6          | globlastp |
| LNU797_H29                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE624039            | 1094              | 3172              | 542                | 96.6          | globlastp |
| LNU797_H30                                                                                                                                                                                                                                                                                                    | arnica 11v1 SRR099034X109165_P1       | 1095              | 3179              | 542                | 96.2          | globlastp |
| LNU797_H31                                                                                                                                                                                                                                                                                                    | artemisia 10v1 EY043858_P1            | 1096              | 3180              | 542                | 96.2          | globlastp |
| LNU797_H32                                                                                                                                                                                                                                                                                                    | euonymus 11v1 SRR070038X195269_P1     | 1097              | 3181              | 542                | 96.2          | globlastp |
| LNU797_H33                                                                                                                                                                                                                                                                                                    | grape 11v1 GSVIVT01016670001_P1       | 1098              | 3182              | 542                | 96.2          | globlastp |
| LNU797_H34                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA02G01700            | 1099              | 3183              | 542                | 96.2          | globlastp |
| LNU797_H34                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA02G01700_P1         | 1100              | 3183              | 542                | 96.2          | globlastp |
| LNU797_H35                                                                                                                                                                                                                                                                                                    | sunflower 12v1 CD848350               | 1101              | 3179              | 542                | 96.2          | globlastp |
| LNU797_H36                                                                                                                                                                                                                                                                                                    | sunflower 12v1 DY926327               | 1102              | 3179              | 542                | 96.2          | globlastp |
| LNU797_H37                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE398301                   | 1103              | 3184              | 542                | 96.2          | globlastp |
| LNU797_H38                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE638088                   | 1104              | 3185              | 542                | 96.2          | globlastp |
| LNU797_H39                                                                                                                                                                                                                                                                                                    | wheat 12v3 CA616043                   | 1105              | 3185              | 542                | 96.2          | globlastp |
| LGP52_H3                                                                                                                                                                                                                                                                                                      | bean 12v2 CA898157_P1                 | 1106              | 3186              | 542                | 95.8          | globlastp |
| LNU797_H40                                                                                                                                                                                                                                                                                                    | amsonia 11v1 SRR098688X100584_P1      | 1107              | 3187              | 542                | 95.8          | globlastp |
| LNU797_H41                                                                                                                                                                                                                                                                                                    | barley 12v1 BE420554_P1               | 1108              | 3188              | 542                | 95.8          | globlastp |
| LNU797_H42                                                                                                                                                                                                                                                                                                    | bean 12v1 CA898157                    | 1109              | 3186              | 542                | 95.8          | globlastp |
| LNU797_H43                                                                                                                                                                                                                                                                                                    | chestnut gb170 SRR006295S0000440_P1   | 1110              | 3189              | 542                | 95.8          | globlastp |
| LNU797_H44                                                                                                                                                                                                                                                                                                    | cichorium gb171 EH695394_P1           | 1111              | 3190              | 542                | 95.8          | globlastp |
| LNU797_H45                                                                                                                                                                                                                                                                                                    | coffea 10v1 DV681794_P1               | 1112              | 3191              | 542                | 95.8          | globlastp |
| LNU797_H46                                                                                                                                                                                                                                                                                                    | cotton 11v1 CO098301_P1               | 1113              | 3192              | 542                | 95.8          | globlastp |
| LNU797_H47                                                                                                                                                                                                                                                                                                    | cowpea 12v1 FF391241_P1               | 1114              | 3186              | 542                | 95.8          | globlastp |
| LNU797_H48                                                                                                                                                                                                                                                                                                    | dandelion 10v1 DR398974_P1            | 1115              | 3190              | 542                | 95.8          | globlastp |
| LNU797_H49                                                                                                                                                                                                                                                                                                    | eschscholzia 11v1 CK745182_P1         | 1116              | 3193              | 542                | 95.8          | globlastp |
| LNU797_H50                                                                                                                                                                                                                                                                                                    | euonymus 11v1 SRR070038X148521_P1     | 1117              | 3194              | 542                | 95.8          | globlastp |
| LNU797_H51                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 DR460270_P1  | 1118              | 3195              | 542                | 95.8          | globlastp |
| LNU797_H52                                                                                                                                                                                                                                                                                                    | heritiera 10v1 SRR005794S0001293_P1   | 1119              | 3196              | 542                | 95.8          | globlastp |
| LNU797_H53                                                                                                                                                                                                                                                                                                    | lettuce 12v1 DW046332_P1              | 1120              | 3190              | 542                | 95.8          | globlastp |
| LNU797_H54                                                                                                                                                                                                                                                                                                    | lotus 09v1 AW720222_P1                | 1121              | 3197              | 542                | 95.8          | globlastp |
| LNU797_H55                                                                                                                                                                                                                                                                                                    | oak 10v1 FP043285_P1                  | 1122              | 3189              | 542                | 95.8          | globlastp |
| LNU797_H56                                                                                                                                                                                                                                                                                                    | sunflower 12v1 CD849067               | 1123              | 3198              | 542                | 95.8          | globlastp |
| LNU797_H57                                                                                                                                                                                                                                                                                                    | tabernaemontana 11v1 SRR098689X106530 | 1124              | 3199              | 542                | 95.8          | globlastp |
| LNU797_H58                                                                                                                                                                                                                                                                                                    | tragopogon 10v1 SRR020205S0002302     | 1125              | 3190              | 542                | 95.8          | globlastp |
| LNU797_H59                                                                                                                                                                                                                                                                                                    | vinca 11v1 SRR098690X108966           | 1126              | 3200              | 542                | 95.8          | globlastp |
| LNU797_H60                                                                                                                                                                                                                                                                                                    | vinca 11v1 SRR098690X131739           | 1127              | 3201              | 542                | 95.8          | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                         |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                    | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LGP52_H2                                                                                                                                                                                                                                                                                                      | prunus_mume 13v1 BU045923_P1            | 1128              | 3202              | 542                | 95.4          | globlastp |
| LNU797_H61                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346935.111437_P1       | 1129              | 3203              | 542                | 95.4          | globlastp |
| LNU797_H62                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346943.182031_P1       | 1130              | 3203              | 542                | 95.4          | globlastp |
| LNU797_H63                                                                                                                                                                                                                                                                                                    | arnica 11v1 SRR099034X103642_P1         | 1131              | 3204              | 542                | 95.4          | globlastp |
| LNU797_H64                                                                                                                                                                                                                                                                                                    | banana 12v1 BBS104T3_P1                 | 1132              | 3205              | 542                | 95.4          | globlastp |
| LNU797_H65                                                                                                                                                                                                                                                                                                    | cacao 10v1 CU484574_P1                  | 1133              | 3206              | 542                | 95.4          | globlastp |
| LNU797_H66                                                                                                                                                                                                                                                                                                    | catharanthus 11v1 SRR098691X100536_P1   | 1134              | 3207              | 542                | 95.4          | globlastp |
| LNU797_H67                                                                                                                                                                                                                                                                                                    | cotton 11v1 BE052796_P1                 | 1135              | 3208              | 542                | 95.4          | globlastp |
| LNU797_H68                                                                                                                                                                                                                                                                                                    | cotton 11v1 BF272890_P1                 | 1136              | 3209              | 542                | 95.4          | globlastp |
| LNU797_H69                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 BE052796_P1    | 1137              | 3208              | 542                | 95.4          | globlastp |
| LNU797_H70                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 BG440472_P1    | 1138              | 3209              | 542                | 95.4          | globlastp |
| LNU797_H71                                                                                                                                                                                                                                                                                                    | humulus 11v1 ES653444_P1                | 1139              | 3210              | 542                | 95.4          | globlastp |
| LNU797_H72                                                                                                                                                                                                                                                                                                    | medicago 12v1 BE205283_P1               | 1140              | 3211              | 542                | 95.4          | globlastp |
| LNU797_H73                                                                                                                                                                                                                                                                                                    | momordica 10v1 SRR071315S0000877_P1     | 1141              | 3212              | 542                | 95.4          | globlastp |
| LNU797_H74                                                                                                                                                                                                                                                                                                    | nasturtium 11v1 SRR032558.130953_P1     | 1142              | 3213              | 542                | 95.4          | globlastp |
| LNU797_H75                                                                                                                                                                                                                                                                                                    | poppy 11v1 SRR030261.67760_P1           | 1143              | 3214              | 542                | 95.4          | globlastp |
| LNU797_H76                                                                                                                                                                                                                                                                                                    | prunus 10v1 BU045923_P1                 | 1144              | 3202              | 542                | 95.4          | globlastp |
| LNU797_H77                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA10G01760_P1           | 1145              | 3215              | 542                | 95.4          | globlastp |
| LNU797_H77                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA10G01760_P1           | 1146              | 3215              | 542                | 95.4          | globlastp |
| LNU797_H78                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA10G42650_P1           | 1147              | 3213              | 542                | 95.4          | globlastp |
| LNU797_H78                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA10G42650_P1           | 1148              | 3213              | 542                | 95.4          | globlastp |
| LNU797_H79                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA20G24380_P1           | 1149              | 3213              | 542                | 95.4          | globlastp |
| LNU797_H79                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA20G24380_P1           | 1150              | 3213              | 542                | 95.4          | globlastp |
| LNU797_H80                                                                                                                                                                                                                                                                                                    | trigonella 11v1 SRR066194X100358_P1     | 1151              | 3211              | 542                | 95.4          | globlastp |
| LNU797_H81                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE516233_P1                  | 1152              | 3216              | 542                | 95.4          | globlastp |
| LNU797_H82                                                                                                                                                                                                                                                                                                    | clover gb162 BB904539_T1                | 1153              | 3217              | 542                | 95.36         | globlastp |
| LNU797_H83                                                                                                                                                                                                                                                                                                    | tripterygium 11v1 SRR098677X108743_P1   | 1154              | 3218              | 542                | 95.36         | globlastp |
| LNU797_H84                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346935.162287_T1       | 1155              | 3219              | 542                | 94.94         | globlastp |
| LNU797_H85                                                                                                                                                                                                                                                                                                    | arabidopsis_lyrata 09v1 JGIAL004906_P1  | 1156              | 3220              | 542                | 94.9          | globlastp |
| LNU797_H86                                                                                                                                                                                                                                                                                                    | arabidopsis 10v1 AT1G53850_P1           | 1157              | 3220              | 542                | 94.9          | globlastp |
| LNU797_H87                                                                                                                                                                                                                                                                                                    | arabidopsis 10v1 AT3G14290_P1           | 1158              | 3221              | 542                | 94.9          | globlastp |
| LNU797_H88                                                                                                                                                                                                                                                                                                    | aristolochia 10v1 FD753041_P1           | 1159              | 3222              | 542                | 94.9          | globlastp |
| LNU797_H89                                                                                                                                                                                                                                                                                                    | centaurea gb166 EH720898_P1             | 1160              | 3223              | 542                | 94.9          | globlastp |
| LNU797_H90                                                                                                                                                                                                                                                                                                    | chelidonium 11v1 SRR084752X101469_P1    | 1161              | 3224              | 542                | 94.9          | globlastp |
| LNU797_H91                                                                                                                                                                                                                                                                                                    | chickpea 11v1 GR406082_P1               | 1162              | 3225              | 542                | 94.9          | globlastp |
| LNU797_H91                                                                                                                                                                                                                                                                                                    | chickpea 13v2 GR406082_P1               | 1163              | 3225              | 542                | 94.9          | globlastp |
| LNU797_H92                                                                                                                                                                                                                                                                                                    | cirsium 11v1 SRR346952.1003064_P1       | 1164              | 3223              | 542                | 94.9          | globlastp |
| LNU797_H93                                                                                                                                                                                                                                                                                                    | cirsium 11v1 SRR346952.101704_P1        | 1165              | 3223              | 542                | 94.9          | globlastp |
| LNU797_H94                                                                                                                                                                                                                                                                                                    | clementine 11v1 CF418418_P1             | 1166              | 3226              | 542                | 94.9          | globlastp |
| LNU797_H95                                                                                                                                                                                                                                                                                                    | cowpea 12v1 FF400036_P1                 | 1167              | 3227              | 542                | 94.9          | globlastp |
| LNU797_H96                                                                                                                                                                                                                                                                                                    | cynara gb167 GE586707_P1                | 1168              | 3223              | 542                | 94.9          | globlastp |
| LNU797_H97                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149229.124001_P1       | 1169              | 3228              | 542                | 94.9          | globlastp |
| LNU797_H98                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149229.164802_P1       | 1170              | 3228              | 542                | 94.9          | globlastp |
| LNU797_H99                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149229.187551_P1       | 1171              | 3228              | 542                | 94.9          | globlastp |
| LNU797_H100                                                                                                                                                                                                                                                                                                   | flaveria 11v1 SRR149232.124521_P1       | 1172              | 3228              | 542                | 94.9          | globlastp |
| LNU797_H101                                                                                                                                                                                                                                                                                                   | kiwi gb166 FG416367_P1                  | 1173              | 3229              | 542                | 94.9          | globlastp |
| LNU797_H102                                                                                                                                                                                                                                                                                                   | oil_palm 11v1 GH636084_P1               | 1174              | 3230              | 542                | 94.9          | globlastp |
| LNU797_H103                                                                                                                                                                                                                                                                                                   | orange 11v1 CB322089_P1                 | 1175              | 3226              | 542                | 94.9          | globlastp |
| LNU797_H104                                                                                                                                                                                                                                                                                                   | pea 11v1 AM161973_P1                    | 1176              | 3231              | 542                | 94.9          | globlastp |
| LNU797_H105                                                                                                                                                                                                                                                                                                   | pigeonpea 11v1 SRR054580X103301_P1      | 1177              | 3232              | 542                | 94.9          | globlastp |
| LNU797_H106                                                                                                                                                                                                                                                                                                   | poppy 11v1 FG610932_P1                  | 1178              | 3233              | 542                | 94.9          | globlastp |
| LNU797_H107                                                                                                                                                                                                                                                                                                   | safflower gb162 EL375904_P1             | 1179              | 3223              | 542                | 94.9          | globlastp |
| LNU797_H108                                                                                                                                                                                                                                                                                                   | scabiosa 11v1 SRR063723X104505_P1       | 1180              | 3234              | 542                | 94.9          | globlastp |
| LNU797_H109                                                                                                                                                                                                                                                                                                   | valeriana 11v1 SRR099039X102707_P1      | 1181              | 3235              | 542                | 94.9          | globlastp |
| LNU797_H110                                                                                                                                                                                                                                                                                                   | watermelon 11v1 CK756307_P1             | 1182              | 3236              | 542                | 94.9          | globlastp |
| LNU797_H111                                                                                                                                                                                                                                                                                                   | antirrhinum gb166 AJ793100_T1           | 1183              | 3237              | 542                | 94.51         | globlastp |
| LNU797_H112                                                                                                                                                                                                                                                                                                   | sarracenia 11v1 SRR192669.135220_P1     | 1184              | 3238              | 542                | 94.51         | globlastp |
| LGP52_H4                                                                                                                                                                                                                                                                                                      | bean 12v2 CA905741_P1                   | 1185              | 3239              | 542                | 94.5          | globlastp |
| LNU797_H113                                                                                                                                                                                                                                                                                                   | arabidopsis_lyrata 09v1 JGIAL009899_P1  | 1186              | 3240              | 542                | 94.5          | globlastp |
| LNU797_H114                                                                                                                                                                                                                                                                                                   | bean 12v1 CA905741_P1                   | 1187              | 3239              | 542                | 94.5          | globlastp |
| LNU797_H115                                                                                                                                                                                                                                                                                                   | beech 11v1 SRR006293.26585_P1           | 1188              | 3241              | 542                | 94.5          | globlastp |
| LNU797_H116                                                                                                                                                                                                                                                                                                   | beech 11v1 SRR006293.26859_P1           | 1189              | 3241              | 542                | 94.5          | globlastp |
| LNU797_H117                                                                                                                                                                                                                                                                                                   | blueberry 12v1 CV090936_P1              | 1190              | 3242              | 542                | 94.5          | globlastp |
| LNU797_H118                                                                                                                                                                                                                                                                                                   | blueberry 12v1 SRR353282X53162D1_P1     | 1191              | 3243              | 542                | 94.5          | globlastp |
| LNU797_H119                                                                                                                                                                                                                                                                                                   | cleome_spinoso 10v1 GR932132_P1         | 1192              | 3244              | 542                | 94.5          | globlastp |
| LNU797_H120                                                                                                                                                                                                                                                                                                   | eschscholzia 11v1 SRR014116.104453_P1   | 1193              | 3245              | 542                | 94.5          | globlastp |
| LNU797_H121                                                                                                                                                                                                                                                                                                   | euphorbia 11v1 DV112478_P1              | 1194              | 3246              | 542                | 94.5          | globlastp |
| LNU797_H122                                                                                                                                                                                                                                                                                                   | oil_palm 11v1 EL688733_P1               | 1195              | 3247              | 542                | 94.5          | globlastp |
| LNU797_H123                                                                                                                                                                                                                                                                                                   | peanut 10v1 CX128176_P1                 | 1196              | 3248              | 542                | 94.5          | globlastp |
| LNU797_H124                                                                                                                                                                                                                                                                                                   | salvia 10v1 SRR014553S0016175_P1        | 1197              | 3249              | 542                | 94.5          | globlastp |
| LNU797_H125                                                                                                                                                                                                                                                                                                   | sesame 12v1 SESI12V1222326_P1           | 1198              | 3250              | 542                | 94.5          | globlastp |
| LNU797_H126                                                                                                                                                                                                                                                                                                   | thellungiella_parvulum 11v1 BY811542_P1 | 1199              | 3251              | 542                | 94.5          | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                           |                   |                   |                    |               |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|-------------------|-------------------|--------------------|---------------|------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                      | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.     |
| LNU797_H127                                                                                                                                                                                                                                                                                                   | apple 11v1 CN544917_P1                    | 1200              | 3252              | 542                | 94.1          | globlastp  |
| LNU797_H128                                                                                                                                                                                                                                                                                                   | b_juncea 12v1 E6ANDIZ01A5869_P1           | 1201              | 3253              | 542                | 94.1          | globlastp  |
| LNU797_H129                                                                                                                                                                                                                                                                                                   | b_juncea 12v1 E6ANDIZ01AGQ24_P1           | 1202              | 3254              | 542                | 94.1          | globlastp  |
| LNU797_H130                                                                                                                                                                                                                                                                                                   | b_juncea 12v1 E6ANDIZ01B06M7_P1           | 1203              | 3255              | 542                | 94.1          | globlastp  |
| LNU797_H131                                                                                                                                                                                                                                                                                                   | b_juncea 12v1 E6ANDIZ01BBFF_P1            | 1204              | 3256              | 542                | 94.1          | globlastp  |
| LNU797_H132                                                                                                                                                                                                                                                                                                   | b_rapa 11v1 CD821133_P1                   | 1205              | 3257              | 542                | 94.1          | globlastp  |
| LNU797_H133                                                                                                                                                                                                                                                                                                   | b_rapa 11v1 CD824786_P1                   | 1206              | 3255              | 542                | 94.1          | globlastp  |
| LNU797_H134                                                                                                                                                                                                                                                                                                   | canola 11v1 CN734250_P1                   | 1207              | 3257              | 542                | 94.1          | globlastp  |
| LNU797_H135                                                                                                                                                                                                                                                                                                   | canola 11v1 CN736323_P1                   | 1208              | 3255              | 542                | 94.1          | globlastp  |
| LNU797_H136                                                                                                                                                                                                                                                                                                   | canola 11v1 EE457068_P1                   | 1209              | 3255              | 542                | 94.1          | globlastp  |
| LNU797_H137                                                                                                                                                                                                                                                                                                   | cleome_spinosal10v1 GR931830_P1           | 1210              | 3258              | 542                | 94.1          | globlastp  |
| LNU797_H138                                                                                                                                                                                                                                                                                                   | cucurbita 11v1 FG227107_P1                | 1211              | 3259              | 542                | 94.1          | globlastp  |
| LNU797_H139                                                                                                                                                                                                                                                                                                   | eucalyptus 11v2 CD669666_P1               | 1212              | 3260              | 542                | 94.1          | globlastp  |
| LNU797_H140                                                                                                                                                                                                                                                                                                   | euphorbia 11v1 SRR098678X123510_P1        | 1213              | 3261              | 542                | 94.1          | globlastp  |
| LNU797_H141                                                                                                                                                                                                                                                                                                   | fagopyrum 11v1 SRR063703X104315_P1        | 1214              | 3262              | 542                | 94.1          | globlastp  |
| LNU797_H142                                                                                                                                                                                                                                                                                                   | flaveria 11v1 SRR149229.113631_P1         | 1215              | 3263              | 542                | 94.1          | globlastp  |
| LNU797_H143                                                                                                                                                                                                                                                                                                   | orobanche 10v1 SRR023189S0023437_P1       | 1216              | 3264              | 542                | 94.1          | globlastp  |
| LNU797_H144                                                                                                                                                                                                                                                                                                   | phalaenopsis 11v1 CB033196_P1             | 1217              | 3265              | 542                | 94.1          | globlastp  |
| LNU797_H145                                                                                                                                                                                                                                                                                                   | platanus 11v1 SRR096786X100928_P1         | 1218              | 3266              | 542                | 94.1          | globlastp  |
| LNU797_H146                                                                                                                                                                                                                                                                                                   | poppy 11v1 FE964610_P1                    | 1219              | 3267              | 542                | 94.1          | globlastp  |
| LNU797_H147                                                                                                                                                                                                                                                                                                   | radish gb164 EV528186                     | 1220              | 3255              | 542                | 94.1          | globlastp  |
| LNU797_H148                                                                                                                                                                                                                                                                                                   | spurge gb161 DV112478                     | 1221              | 3268              | 542                | 94.1          | globlastp  |
| LNU797_H149                                                                                                                                                                                                                                                                                                   | tobacco gb162 AB001552                    | 1222              | 3269              | 542                | 94.1          | globlastp  |
| LNU797_H150                                                                                                                                                                                                                                                                                                   | triphysaria 10v1 EX999501                 | 1223              | 3270              | 542                | 94.1          | globlastp  |
| LNU797_H151                                                                                                                                                                                                                                                                                                   | triphysaria 10v1 EY014414                 | 1224              | 3271              | 542                | 94.1          | globlastp  |
| LNU797_H216                                                                                                                                                                                                                                                                                                   | olea 13v1 SRR014463X18338D1_P1            | 1225              | 3272              | 542                | 94.1          | globlastp  |
| LNU797_H152                                                                                                                                                                                                                                                                                                   | ginseng 10v1 CN845666_T1                  | 1226              | 3273              | 542                | 94.09         | glotblastn |
| LNU797_H153                                                                                                                                                                                                                                                                                                   | sarracenia 11v1 SRR192669.105817          | 1227              | 3274              | 542                | 94.09         | glotblastn |
| LGP52_H5                                                                                                                                                                                                                                                                                                      | castorbean 12v1 EE260427_P1               | 1228              | 3275              | 542                | 93.7          | globlastp  |
| LGP52_H7                                                                                                                                                                                                                                                                                                      | monkeyflower 12v1 DV206269_P1             | 1229              | 3276              | 542                | 93.7          | globlastp  |
| LNU797_H154                                                                                                                                                                                                                                                                                                   | b_oleracea gb161 DY026308_P1              | 1230              | 3277              | 542                | 93.7          | globlastp  |
| LNU797_H155                                                                                                                                                                                                                                                                                                   | b_rapa 11v1 BG543962_P1                   | 1231              | 3277              | 542                | 93.7          | globlastp  |
| LNU797_H156                                                                                                                                                                                                                                                                                                   | canola 11v1 DY006413_P1                   | 1232              | 3277              | 542                | 93.7          | globlastp  |
| LNU797_H157                                                                                                                                                                                                                                                                                                   | canola 11v1 EE454294_P1                   | 1233              | 3278              | 542                | 93.7          | globlastp  |
| LNU797_H158                                                                                                                                                                                                                                                                                                   | canola 11v1 EE454622_P1                   | 1234              | 3277              | 542                | 93.7          | globlastp  |
| LNU797_H160                                                                                                                                                                                                                                                                                                   | cleome_gynandra 10v1 SRR015532S0002255_P1 | 1235              | 3279              | 542                | 93.7          | globlastp  |
| LNU797_H161                                                                                                                                                                                                                                                                                                   | cucumber 09v1 CK756307_P1                 | 1236              | 3280              | 542                | 93.7          | globlastp  |
| LNU797_H162                                                                                                                                                                                                                                                                                                   | cucurbita 11v1 SRR091276X151710_P1        | 1237              | 3281              | 542                | 93.7          | globlastp  |
| LNU797_H163                                                                                                                                                                                                                                                                                                   | hornbeam 12v1 SRR364455.122361_P1         | 1238              | 3282              | 542                | 93.7          | globlastp  |
| LNU797_H164                                                                                                                                                                                                                                                                                                   | ipomoea_nil 10v1 BJ559450_P1              | 1239              | 3283              | 542                | 93.7          | globlastp  |
| LNU797_H165                                                                                                                                                                                                                                                                                                   | melon 10v1 DV633226_P1                    | 1240              | 3280              | 542                | 93.7          | globlastp  |
| LNU797_H167                                                                                                                                                                                                                                                                                                   | phyla 11v2 SRR099035X105603_P1            | 1241              | 3284              | 542                | 93.7          | globlastp  |
| LNU797_H168                                                                                                                                                                                                                                                                                                   | poppy 11v1 SRR030259.236762_P1            | 1242              | 3285              | 542                | 93.7          | globlastp  |
| LNU797_H169                                                                                                                                                                                                                                                                                                   | radish gb164 EV532244                     | 1243              | 3277              | 542                | 93.7          | globlastp  |
| LNU797_H170                                                                                                                                                                                                                                                                                                   | radish gb164 EV544576                     | 1244              | 3286              | 542                | 93.7          | globlastp  |
| LNU797_H171                                                                                                                                                                                                                                                                                                   | radish gb164 EW724310                     | 1245              | 3287              | 542                | 93.7          | globlastp  |
| LNU797_H172                                                                                                                                                                                                                                                                                                   | radish gb164 EX895850                     | 1246              | 3277              | 542                | 93.7          | globlastp  |
| LNU797_H173                                                                                                                                                                                                                                                                                                   | solanum_phureja 09v1 SPHAJ487384          | 1247              | 3288              | 542                | 93.7          | globlastp  |
| LNU797_H174                                                                                                                                                                                                                                                                                                   | tomato 11v1 AB001552                      | 1248              | 3289              | 542                | 93.7          | globlastp  |
| LNU797_H175                                                                                                                                                                                                                                                                                                   | tomato 11v1 AJ487384                      | 1249              | 3288              | 542                | 93.7          | globlastp  |
| LNU797_H188                                                                                                                                                                                                                                                                                                   | poplar 13v1 BU823181_P1                   | 1250              | 3290              | 542                | 93.7          | globlastp  |
| LNU797_H176                                                                                                                                                                                                                                                                                                   | cassava 09v1 JGICASSAVA42237VALIDM1_T1    | 1251              | 3291              | 542                | 93.67         | glotblastn |
| LNU797_H177                                                                                                                                                                                                                                                                                                   | fagopyrum 11v1 SRR063689X100469_T1        | 1252              | 3292              | 542                | 93.67         | glotblastn |
| LNU797_H178                                                                                                                                                                                                                                                                                                   | fraxinus 11v1 SRR058827.113356_T1         | 1253              | 3293              | 542                | 93.67         | glotblastn |
| LNU797_H179                                                                                                                                                                                                                                                                                                   | fraxinus 11v1 SRR058827.100546_T1         | 1254              | 3293              | 542                | 93.25         | glotblastn |
| LNU797_H180                                                                                                                                                                                                                                                                                                   | platanus 11v1 SRR096786X125700_T1         | 1255              | 3294              | 542                | 93.25         | glotblastn |
| LGP52_H6                                                                                                                                                                                                                                                                                                      | monkeyflower 12v1 DV206044_P1             | 1256              | 3295              | 542                | 93.2          | globlastp  |
| LGP52_H8                                                                                                                                                                                                                                                                                                      | nicotiana_benthiana 12v1 BP748670_P1      | 1257              | 3296              | 542                | 93.2          | globlastp  |
| LGP52_H10                                                                                                                                                                                                                                                                                                     | nicotiana_benthiana 12v1 CN747657_P1      | 1258              | 3297              | 542                | 93.2          | globlastp  |
| LNU797_H181                                                                                                                                                                                                                                                                                                   | fraxinus 11v1 SRR058827.105716_P1         | 1259              | 3298              | 542                | 93.2          | globlastp  |
| LNU797_H182                                                                                                                                                                                                                                                                                                   | ginger gb164 DY345083_P1                  | 1260              | 3299              | 542                | 93.2          | globlastp  |
| LNU797_H183                                                                                                                                                                                                                                                                                                   | jatropha 09v1 FM889898_P1                 | 1261              | 3300              | 542                | 93.2          | globlastp  |
| LNU797_H184                                                                                                                                                                                                                                                                                                   | monkeyflower 10v1 DV206044                | 1262              | 3295              | 542                | 93.2          | globlastp  |
| LNU797_H185                                                                                                                                                                                                                                                                                                   | orobanche 10v1 SRR023189S0003752_P1       | 1263              | 3301              | 542                | 93.2          | globlastp  |
| LNU797_H186                                                                                                                                                                                                                                                                                                   | pepper 12v1 BM067274_P1                   | 1264              | 3302              | 542                | 93.2          | globlastp  |
| LNU797_H187                                                                                                                                                                                                                                                                                                   | phyla 11v2 SRR099035X28578_P1             | 1265              | 3303              | 542                | 93.2          | globlastp  |
| LNU797_H188                                                                                                                                                                                                                                                                                                   | poplar 10v1 BU823181                      | 1266              | 3304              | 542                | 93.2          | globlastp  |
| LNU797_H189                                                                                                                                                                                                                                                                                                   | poplar 10v1 BU887035                      | 1267              | 3305              | 542                | 93.2          | globlastp  |
| LNU797_H189                                                                                                                                                                                                                                                                                                   | poplar 13v1 BU887035_P1                   | 1268              | 3305              | 542                | 93.2          | globlastp  |
| LNU797_H190                                                                                                                                                                                                                                                                                                   | rose 12v1 EC589334                        | 1269              | 3306              | 542                | 93.2          | globlastp  |
| LNU797_H191                                                                                                                                                                                                                                                                                                   | salvia 10v1 FE536702                      | 1270              | 3307              | 542                | 93.2          | globlastp  |
| LNU797_H192                                                                                                                                                                                                                                                                                                   | strawberry 11v1 DV439642                  | 1271              | 3308              | 542                | 93.2          | globlastp  |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                         |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                    | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU797_H193                                                                                                                                                                                                                                                                                                   | tobacco gb162 CV018545                  | 1272              | 3309              | 542                | 93.2          | globlastp |
| LNU797_H194                                                                                                                                                                                                                                                                                                   | thellungiella_halophilum 11v1 BY811542  | 1273              | 3310              | 542                | 92.83         | globlastn |
| LNU797_H262                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana 12v1 EB425542_P1    | 1274              | 3311              | 542                | 92.8          | globlastp |
| LGP52_H9                                                                                                                                                                                                                                                                                                      | zostera 12v1 AM766202_P1                | 1275              | 3312              | 542                | 92.8          | globlastp |
| LNU797_H195                                                                                                                                                                                                                                                                                                   | eggplant 10v1 FS014765_P1               | 1276              | 3313              | 542                | 92.8          | globlastp |
| LNU797_H196                                                                                                                                                                                                                                                                                                   | nuphar gb166 CK746396_P1                | 1277              | 3314              | 542                | 92.8          | globlastp |
| LNU797_H197                                                                                                                                                                                                                                                                                                   | parthenium 10v1 GW780462_P1             | 1278              | 3315              | 542                | 92.8          | globlastp |
| LNU797_H198                                                                                                                                                                                                                                                                                                   | phalaenopsis 11v1 CB032504_P1           | 1279              | 3316              | 542                | 92.8          | globlastp |
| LNU797_H199                                                                                                                                                                                                                                                                                                   | zostera 10v1 AM766202                   | 1280              | 3312              | 542                | 92.8          | globlastp |
| LNU797_H200                                                                                                                                                                                                                                                                                                   | banana 12v1 DN239316_P1                 | 1281              | 3317              | 542                | 92.6          | globlastp |
| LNU797_H201                                                                                                                                                                                                                                                                                                   | rye 12v1 DRR001012.220584               | 1282              | 3318              | 542                | 92.41         | globlastn |
| LNU797_H263                                                                                                                                                                                                                                                                                                   | olea 13v1 SRR014464X10873D1_P1          | 1283              | 3319              | 542                | 92.4          | globlastp |
| LGP52_H11                                                                                                                                                                                                                                                                                                     | olea 13v1 SRR014463X25018D1_P1          | 1284              | 3320              | 542                | 92.4          | globlastp |
| LNU797_H202                                                                                                                                                                                                                                                                                                   | amorphophallus 11v2 SRR089351X147361_P1 | 1285              | 3321              | 542                | 92.4          | globlastp |
| LNU797_H203                                                                                                                                                                                                                                                                                                   | antirrhinum gb166 AJ798448_P1           | 1286              | 3322              | 542                | 92.4          | globlastp |
| LNU797_H204                                                                                                                                                                                                                                                                                                   | silene 11v1 GH294688                    | 1287              | 3323              | 542                | 92.4          | globlastp |
| LNU797_H205                                                                                                                                                                                                                                                                                                   | cycas gb166 DR061950_P1                 | 1288              | 3324              | 542                | 92            | globlastp |
| LNU797_H206                                                                                                                                                                                                                                                                                                   | tobacco gb162 EB425542                  | 1289              | 3325              | 542                | 92            | globlastp |
| LNU797_H207                                                                                                                                                                                                                                                                                                   | euphorbia 11v1 BP961521_T1              | 1290              | 3326              | 542                | 91.98         | globlastn |
| LNU797_H208                                                                                                                                                                                                                                                                                                   | zamia gb166 FD773811                    | 1291              | 3327              | 542                | 91.6          | globlastp |
| LNU797_H209                                                                                                                                                                                                                                                                                                   | lovegrass gb167 EH183763_T1             | 1292              | 3328              | 542                | 91.14         | globlastn |
| LNU797_H210                                                                                                                                                                                                                                                                                                   | tripterygium 11v1 SRR098677X101097      | 1293              | 3329              | 542                | 91.1          | globlastp |
| LNU797_H211                                                                                                                                                                                                                                                                                                   | vinca 11v1 SRR098690X109756             | 1294              | 3330              | 542                | 91.1          | globlastp |
| LNU797_H212                                                                                                                                                                                                                                                                                                   | banana 12v1 MAGEN2012011862_P1          | 1295              | 3331              | 542                | 90.7          | globlastp |
| LNU797_H213                                                                                                                                                                                                                                                                                                   | clementine 11v1 EY827323_T1             | 1296              | 3332              | 542                | 90.3          | globlastn |
| LNU797_H214                                                                                                                                                                                                                                                                                                   | orange 11v1 CF835946_T1                 | 1297              | 3333              | 542                | 90.3          | globlastn |
| LGP52_H12                                                                                                                                                                                                                                                                                                     | nicotiana_benthiana 12v1 FG198486_P1    | 1298              | 3334              | 542                | 90.1          | globlastp |
| LNU797_H215                                                                                                                                                                                                                                                                                                   | aquilegia 10v2 DR919315_P1              | 1299              | 3335              | 542                | 90            | globlastp |
| LNU797_H216                                                                                                                                                                                                                                                                                                   | olea 11v1 SRR014463.18338               | 1300              | 3336              | 542                | 89.8          | globlastp |
| LNU797_H217                                                                                                                                                                                                                                                                                                   | petunia gb171 FN002916_P1               | 1301              | 3337              | 542                | 89.8          | globlastp |
| LNU797_H218                                                                                                                                                                                                                                                                                                   | guizotia 10v1 GE558856_P1               | 1302              | 3338              | 542                | 89.5          | globlastp |
| LNU797_H219                                                                                                                                                                                                                                                                                                   | parthenium 10v1 GW785978_P1             | 1303              | 3339              | 542                | 89.5          | globlastp |
| LNU797_H220                                                                                                                                                                                                                                                                                                   | liriodendron gb166 CK757590_T1          | 1304              | 3340              | 542                | 89.03         | globlastn |
| LNU797_H221                                                                                                                                                                                                                                                                                                   | rye 12v1 DRR001012.749006               | 1305              | 3341              | 542                | 88.43         | globlastn |
| LNU797_H222                                                                                                                                                                                                                                                                                                   | ceratodon 10v1 SRR074890S0022447_P1     | 1306              | 3342              | 542                | 88.2          | globlastp |
| LGP52_H13                                                                                                                                                                                                                                                                                                     | nicotiana_benthiana 12v1 EH620293_T1    | 1307              | 3343              | 542                | 88.19         | globlastn |
| LNU797_H223                                                                                                                                                                                                                                                                                                   | ambrosia 11v1 SRR346943.100828_T1       | 1308              | 3344              | 542                | 87.76         | globlastn |
| LNU797_H224                                                                                                                                                                                                                                                                                                   | fraxinus 11v1 SRR058827.123528_T1       | 1309              | 3345              | 542                | 87.76         | globlastn |
| LNU797_H225                                                                                                                                                                                                                                                                                                   | physcomitrella 10v1 AJ225438_P1         | 1310              | 3346              | 542                | 87.3          | globlastp |
| LNU797_H226                                                                                                                                                                                                                                                                                                   | physcomitrella 10v1 AW699661_P1         | 1311              | 3347              | 542                | 87.3          | globlastp |
| LNU797_H227                                                                                                                                                                                                                                                                                                   | spikemoss gb165 FE508399                | 1312              | 3348              | 542                | 87.3          | globlastp |
| LNU797_H228                                                                                                                                                                                                                                                                                                   | cephalotaxus 11v1 SRR064395X105137_P1   | 1313              | 3349              | 542                | 86.9          | globlastp |
| LNU797_H229                                                                                                                                                                                                                                                                                                   | cryptomeria gb166 BP174342_P1           | 1314              | 3350              | 542                | 86.9          | globlastp |
| LNU797_H230                                                                                                                                                                                                                                                                                                   | maritime_pine 10v1 BX249273_P1          | 1315              | 3351              | 542                | 86.9          | globlastp |
| LNU797_H231                                                                                                                                                                                                                                                                                                   | pine 10v2 AW587810_P1                   | 1316              | 3351              | 542                | 86.9          | globlastp |
| LNU797_H232                                                                                                                                                                                                                                                                                                   | podocarpus 10v1 SRR065014S0007113_P1    | 1317              | 3352              | 542                | 86.9          | globlastp |
| LNU797_H233                                                                                                                                                                                                                                                                                                   | potato 10v1 AJ487384_P1                 | 1318              | 3353              | 542                | 86.9          | globlastp |
| LNU797_H234                                                                                                                                                                                                                                                                                                   | sequoia 10v1 SRR065044S0017123          | 1319              | 3354              | 542                | 86.9          | globlastp |
| LNU797_H235                                                                                                                                                                                                                                                                                                   | spruce 11v1 ES249872                    | 1320              | 3355              | 542                | 86.9          | globlastp |
| LNU797_H236                                                                                                                                                                                                                                                                                                   | taxus 10v1 SRR032523S0013310            | 1321              | 3349              | 542                | 86.9          | globlastp |
| LNU797_H237                                                                                                                                                                                                                                                                                                   | flaveria 11v1 SRR149232.152816_P1       | 1322              | 3356              | 542                | 86.5          | globlastp |
| LNU797_H238                                                                                                                                                                                                                                                                                                   | pseudotsuga 10v1 SRR065119S0007920      | 1323              | 3357              | 542                | 86.5          | globlastp |
| LNU797_H239                                                                                                                                                                                                                                                                                                   | pteridium 11v1 SRR043594X10900          | 1324              | 3358              | 542                | 86.5          | globlastn |
| LNU797_H240                                                                                                                                                                                                                                                                                                   | marchantia gb166 BJ844657_P1            | 1325              | 3359              | 542                | 86.1          | globlastp |
| LNU797_H241                                                                                                                                                                                                                                                                                                   | sciadopitys 10v1 SRR065035S0004334      | 1326              | 3360              | 542                | 86.1          | globlastp |
| LNU797_H242                                                                                                                                                                                                                                                                                                   | abies 11v2 SRR098676X104726_P1          | 1327              | 3361              | 542                | 85.7          | globlastp |
| LNU797_H243                                                                                                                                                                                                                                                                                                   | cedrus 11v1 SRR065007X120238_P1         | 1328              | 3362              | 542                | 85.7          | globlastp |
| LNU797_H244                                                                                                                                                                                                                                                                                                   | radish gb164 EV532879                   | 1329              | 3363              | 542                | 85.2          | globlastp |
| LNU797_H245                                                                                                                                                                                                                                                                                                   | tea 10v1 GT087989                       | 1330              | 3364              | 542                | 85.2          | globlastp |
| LNU797_H246                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana gb162 CN747657      | 1331              | 3365              | 542                | 84.4          | globlastp |
| LNU797_H247                                                                                                                                                                                                                                                                                                   | gnetum 10v1 EX949788_P1                 | 1332              | 3366              | 542                | 84            | globlastp |
| LNU797_H248                                                                                                                                                                                                                                                                                                   | sugarcane 10v1 BQ536868                 | 1333              | 3367              | 542                | 83.9          | globlastp |
| LNU797_H249                                                                                                                                                                                                                                                                                                   | liquorice gb171 FS266885_P1             | 1334              | 3368              | 542                | 83.1          | globlastp |
| LNU797_H250                                                                                                                                                                                                                                                                                                   | poppy 11v1 SRR096789.122184_P1          | 1335              | 3369              | 542                | 82.7          | globlastp |
| LNU797_H251                                                                                                                                                                                                                                                                                                   | radish gb164 EV529042                   | 1336              | 3370              | 542                | 82.7          | globlastp |
| LNU797_H252                                                                                                                                                                                                                                                                                                   | radish gb164 EV539130                   | 1337              | 3370              | 542                | 82.7          | globlastp |
| LNU797_H253                                                                                                                                                                                                                                                                                                   | radish gb164 EV542996                   | 1338              | 3371              | 542                | 82.7          | globlastp |
| LNU797_H254                                                                                                                                                                                                                                                                                                   | cyamopsis 10v1 EG989234_P1              | 1339              | 3372              | 542                | 82.3          | globlastp |
| LNU797_H255                                                                                                                                                                                                                                                                                                   | poppy 11v1 SRR030267.187266_P1          | 1340              | 3373              | 542                | 82.3          | globlastp |
| LNU797_H256                                                                                                                                                                                                                                                                                                   | flax 11v1 JG084720_T1                   | 1341              | 3374              | 542                | 82.28         | globlastn |
| LNU797_H257                                                                                                                                                                                                                                                                                                   | gerbera 09v1 AJ754027_P1                | 1342              | 3375              | 542                | 81.9          | globlastp |
| LNU797_H258                                                                                                                                                                                                                                                                                                   | distylium 11v1 SRR065077X153511_P1      | 1343              | 3376              | 542                | 81.4          | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU797_H259                                                                                                                                                                                                                                                                                                   | lovegrass gb167 EH185755_P1          | 1344              | 3377              | 542                | 81.4          | globlastp |
| LNU797_H260                                                                                                                                                                                                                                                                                                   | blueberry 12v1 SRR353285X11741D1_T1  | 1345              | 3378              | 542                | 81.01         | globlastn |
| LNU797_H261                                                                                                                                                                                                                                                                                                   | poppy 11v1 SRR096789.253826_T1       | 1346              | 3379              | 542                | 81.01         | globlastn |
| LNU798_H1                                                                                                                                                                                                                                                                                                     | barley 12v1 BE422159_P1              | 1347              | 3380              | 543                | 97            | globlastp |
| LNU798_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB02G019500             | 1348              | 3381              | 543                | 93.8          | globlastp |
| LNU798_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI029445M_P1 | 1349              | 3382              | 543                | 93.7          | globlastp |
| LNU798_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 AI629903_P1               | 1350              | 3383              | 543                | 93.5          | globlastp |
| LNU798_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 AL819672                  | 1351              | 3384              | 543                | 91.4          | globlastp |
| LNU798_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 AU174198                   | 1352              | 3385              | 543                | 91.2          | globlastp |
| LNU798_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE609190_P1         | 1353              | 3386              | 543                | 91            | globlastp |
| LNU798_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BQ245545                  | 1354              | 3387              | 543                | 91            | globlastp |
| LNU798_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM023052_P1        | 1355              | 3388              | 543                | 87.3          | globlastp |
| LNU798_H9                                                                                                                                                                                                                                                                                                     | wheat 12v3 BG606377                  | 1356              | 3389              | 543                | 85.4          | globlastp |
| LNU799_H1                                                                                                                                                                                                                                                                                                     | oat 11v1 GR338611_P1                 | 1357              | 3390              | 544                | 95.5          | globlastp |
| LNU799_H2                                                                                                                                                                                                                                                                                                     | leymus gb166 EG397348_P1             | 1358              | 3391              | 544                | 93.9          | globlastp |
| LNU799_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.356736            | 1359              | 3391              | 544                | 93.9          | globlastp |
| LNU799_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.648999            | 1360              | 3391              | 544                | 93.9          | globlastp |
| LNU799_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.761725            | 1361              | 3391              | 544                | 93.9          | globlastp |
| LNU799_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE403020                  | 1362              | 3391              | 544                | 93.9          | globlastp |
| LNU799_H7                                                                                                                                                                                                                                                                                                     | barley 12v1 BI953338_P1              | 1363              | 3392              | 544                | 93.5          | globlastp |
| LNU799_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 AU085931                   | 1364              | 3393              | 544                | 91.1          | globlastp |
| LNU799_H9                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI030913M_P1 | 1365              | 3394              | 544                | 84.4          | globlastp |
| LNU799_H10                                                                                                                                                                                                                                                                                                    | millet 10v1 PMSLX0021480_P1          | 1366              | 3395              | 544                | 84.1          | globlastp |
| LNU799_H11                                                                                                                                                                                                                                                                                                    | maize 10v1 FL234904_P1               | 1367              | 3396              | 544                | 84            | globlastp |
| LNU799_H12                                                                                                                                                                                                                                                                                                    | maize 10v1 AW076436_P1               | 1368              | 3397              | 544                | 83.3          | globlastp |
| LNU799_H13                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB02G024130             | 1369              | 3398              | 544                | 82.9          | globlastp |
| LNU799_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE619626_P1         | 1370              | 3399              | 544                | 82.5          | globlastp |
| LNU799_H14                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE619626           | 1371              | 3400              | 544                | 81.7          | globlastp |
| LNU801_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL970980_P1         | 1372              | 3401              | 546                | 93.1          | globlastp |
| LNU801_H1                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM000992_P1        | 1373              | 3402              | 546                | 92.5          | globlastp |
| LNU801_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB03G046360             | 1374              | 3403              | 546                | 90            | globlastp |
| LNU801_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 BM420996                   | 1375              | 3404              | 546                | 88.79         | globlastn |
| LNU801_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 AI734386_P1               | 1376              | 3405              | 546                | 87.9          | globlastp |
| LNU801_H5                                                                                                                                                                                                                                                                                                     | maize 10v1 BE552901_P1               | 1377              | 3406              | 546                | 87.2          | globlastp |
| LNU801_H6                                                                                                                                                                                                                                                                                                     | barley 12v1 BE412491_P1              | 1378              | 3407              | 546                | 82.9          | globlastp |
| LNU801_H7                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G61240_P1    | 1379              | 3408              | 546                | 82            | globlastp |
| LNU801_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.134722            | 1380              | 3409              | 546                | 81.6          | globlastp |
| LNU802_H1                                                                                                                                                                                                                                                                                                     | rice 11v1 C26804                     | 1381              | 3410              | 547                | 91.3          | globlastp |
| LNU802_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI021421M_P1 | 1382              | 3411              | 547                | 89.1          | globlastp |
| LNU802_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 BF475211                   | 1383              | 3412              | 547                | 88.9          | globlastp |
| LNU802_H20                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL702067_P1         | 1384              | 3413              | 547                | 88.5          | globlastp |
| LNU802_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM003455_P1        | 1385              | 3414              | 547                | 88            | globlastp |
| LNU802_H5                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB09G029750             | 1386              | 3415              | 547                | 87.8          | globlastp |
| LNU802_H6                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G15300T2_P1  | 1387              | 3416              | 547                | 87.2          | globlastp |
| LNU802_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BJ257279                  | 1388              | 3417              | 547                | 86.9          | globlastp |
| LNU802_H8                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR073321X559678D1        | 1389              | 3417              | 547                | 86.9          | globlastp |
| LNU802_H9                                                                                                                                                                                                                                                                                                     | barley 12v1 AV833654_P1              | 1390              | 3418              | 547                | 86.7          | globlastp |
| LNU802_H10                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.106866            | 1391              | 3419              | 547                | 86.5          | globlastp |
| LNU802_H11                                                                                                                                                                                                                                                                                                    | wheat 12v3 CA497108                  | 1392              | 3420              | 547                | 86.5          | globlastp |
| LNU802_H12                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.119952            | 1393              | 3421              | 547                | 86.3          | globlastp |
| LNU802_H13                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.141039            | 1394              | 3422              | 547                | 86.3          | globlastp |
| LNU802_H14                                                                                                                                                                                                                                                                                                    | wheat 12v3 SRR043326X44117D1         | 1395              | 3423              | 547                | 85.7          | globlastp |
| LNU802_H15                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.724073            | 1396              | 3424              | 547                | 84.84         | globlastn |
| LNU802_H16                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.794078            | 1397              | 3425              | 547                | 84.63         | globlastn |
| LNU802_H17                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.762098            | 1398              | 3426              | 547                | 84.6          | globlastp |
| LNU802_H18                                                                                                                                                                                                                                                                                                    | oat 11v1 CN816181_P1                 | 1399              | 3427              | 547                | 83.7          | globlastp |
| LNU802_H19                                                                                                                                                                                                                                                                                                    | wheat 12v3 SRR043323X82204D1         | 1400              | 3428              | 547                | 81.48         | globlastn |
| LNU803_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL957205_P1         | 1401              | 3429              | 548                | 91.1          | globlastp |
| LNU803_H1                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM050490_P1        | 1402              | 3430              | 548                | 89.9          | globlastp |
| LNU803_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 JG811131_P1         | 1403              | 3431              | 548                | 88.6          | globlastp |
| LNU803_H2                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G60317_P1    | 1404              | 3432              | 548                | 88.6          | globlastp |
| LNU803_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL957205           | 1405              | 3433              | 548                | 86.1          | globlastp |
| LNU803_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR364496.92662_T1  | 1406              | 3434              | 548                | 83.54         | globlastn |
| LNU803_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR043323X35031D1         | 1407              | 3435              | 548                | 81.2          | globlastp |
| LNU803_H5                                                                                                                                                                                                                                                                                                     | maize 10v1 AI629617_P1               | 1408              | 3436              | 548                | 81            | globlastp |
| LNU803_H6                                                                                                                                                                                                                                                                                                     | maize 10v1 AW288544_P1               | 1409              | 3436              | 548                | 81            | globlastp |
| LNU805_H2                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 DN145962_T1         | 1410              | 3437              | 550                | 80.05         | globlastn |
| LNU805_H1                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN145962           | 1411              | 3438              | 550                | 80            | globlastn |
| LNU807_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB09G006610             | 1412              | 3439              | 552                | 96.1          | globlastp |
| LNU807_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL935393_P1         | 1413              | 3440              | 552                | 94.6          | globlastp |
| LNU807_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 CD950739_P1               | 1414              | 3441              | 552                | 93.8          | globlastp |
| LNU807_H3                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM000715_P1        | 1415              | 3442              | 552                | 88            | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU807_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 BG605330                  | 1416              | 3443              | 552                | 85.2          | globlastp |
| LNU807_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA627721                  | 1417              | 3444              | 552                | 85            | globlastp |
| LNU807_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR043323X42120D1         | 1418              | 3444              | 552                | 85            | globlastp |
| LNU807_H7                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.103250            | 1419              | 3445              | 552                | 84.9          | globlastp |
| LNU807_H8                                                                                                                                                                                                                                                                                                     | wheat 12v3 CD917464                  | 1420              | 3446              | 552                | 84.7          | globlastp |
| LNU807_H9                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G26810_P1    | 1421              | 3447              | 552                | 84.3          | globlastp |
| LNU807_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 AA753940                   | 1422              | 3448              | 552                | 84.3          | globlastp |
| LNU807_H11                                                                                                                                                                                                                                                                                                    | rice 11v1 BI807965                   | 1423              | 3449              | 552                | 84.3          | globlastp |
| LNU808_H1                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM012822_P1        | 1424              | 3450              | 553                | 95            | globlastp |
| LNU808_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 DN145950_P1         | 1425              | 3451              | 553                | 94.5          | globlastp |
| LNU808_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN145950           | 1426              | 3451              | 553                | 94.5          | globlastp |
| LNU808_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL698385_P1         | 1427              | 3452              | 553                | 93.1          | globlastp |
| LNU808_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB06G033120             | 1428              | 3453              | 553                | 90            | globlastp |
| LNU808_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 CF636626_P1               | 1429              | 3454              | 553                | 89            | globlastp |
| LNU809_H1                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN142820           | 1430              | 3455              | 554                | 93.9          | globlastp |
| LNU809_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BE344743_P1               | 1431              | 3456              | 554                | 87.9          | globlastp |
| LNU809_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G001260             | 1432              | 3457              | 554                | 87.3          | globlastp |
| LNU809_H4                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA110374              | 1433              | 3458              | 554                | 84.7          | globlastp |
| LNU809_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 BI306268                   | 1434              | 3459              | 554                | 82.4          | globlastp |
| LNU810_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 SICRP020917_P1   | 1435              | 3460              | 555                | 95.8          | globlastp |
| LNU810_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI012527M_T1 | 1436              | 3461              | 555                | 94.17         | globlastp |
| LNU810_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 SICRP100316_P1   | 1437              | 3462              | 555                | 89.2          | globlastp |
| LNU810_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM110704_T1        | 1438              | 3463              | 555                | 86.67         | globlastp |
| LNU811_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 BU103402              | 1439              | 3464              | 556                | 81.9          | globlastp |
| LNU811_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB09G001370             | 1440              | 3465              | 556                | 80.5          | globlastp |
| LNU813_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G011930             | 1441              | 3466              | 557                | 89            | globlastp |
| LNU815_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB03G031180             | 1442              | 3467              | 559                | 94            | globlastp |
| LNU815_H2                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA123143              | 1443              | 3468              | 559                | 93.4          | globlastp |
| LNU815_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187765.104957_P1 | 1444              | 3469              | 559                | 91            | globlastp |
| LNU815_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL826760_P1         | 1445              | 3470              | 559                | 89.3          | globlastp |
| LNU815_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI003141M_P1 | 1446              | 3471              | 559                | 89.2          | globlastp |
| LNU815_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL826760           | 1447              | 3472              | 559                | 88.7          | globlastp |
| LNU815_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 AU174360                   | 1448              | 3473              | 559                | 88.6          | globlastp |
| LNU815_H6                                                                                                                                                                                                                                                                                                     | millet 10v1 PMSLX0006943_P1          | 1449              | 3474              | 559                | 85.6          | globlastp |
| LNU815_H7                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.175289            | 1450              | 3475              | 559                | 85            | globlastp |
| LNU815_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.458810            | 1451              | 3475              | 559                | 85            | globlastp |
| LNU815_H9                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G46560_T1    | 1452              | 3476              | 559                | 83.23         | globlastp |
| LNU815_H10                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE442626                  | 1453              | 3477              | 559                | 82.6          | globlastp |
| LNU816_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G53550_P1    | 1454              | 3478              | 560                | 91.5          | globlastp |
| LNU816_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 CA759966                   | 1455              | 3479              | 560                | 91.1          | globlastp |
| LNU816_H10                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001014.10485             | 1456              | 3480              | 560                | 82.1          | globlastp |
| LNU817_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB06G032840             | 1457              | 3481              | 561                | 91.6          | globlastp |
| LNU817_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI714648_P1               | 1458              | 3482              | 561                | 88.9          | globlastp |
| LNU817_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI018613M_P1 | 1459              | 3483              | 561                | 85.5          | globlastp |
| LNU817_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL735544_P1         | 1460              | 3484              | 561                | 84.7          | globlastp |
| LNU817_H4                                                                                                                                                                                                                                                                                                     | cenchrus gb166 EB660297_P1           | 1461              | 3485              | 561                | 84.1          | globlastp |
| LNU817_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL735544           | 1462              | 3486              | 561                | 82.9          | globlastp |
| LNU817_H6                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM108926_P1        | 1463              | 3487              | 561                | 80.1          | globlastp |
| LNU819_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187765.390310_P1 | 1464              | 3488              | 563                | 86.8          | globlastp |
| LNU819_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 EU946864_P1               | 1465              | 3489              | 563                | 86.3          | globlastp |
| LNU819_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL841069_P1         | 1466              | 3490              | 563                | 85.7          | globlastp |
| LNU819_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL841069           | 1467              | 3491              | 563                | 84.6          | globlastp |
| LNU819_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 CF759244                | 1468              | 3492              | 563                | 82.42         | globlastp |
| LNU819_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI031669M_P1 | 1469              | 3493              | 563                | 80.2          | globlastp |
| LNU820_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB07G028630             | 1470              | 3494              | 564                | 91.3          | globlastp |
| LNU820_H2                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM458338_P1        | 1471              | 3495              | 564                | 87            | globlastp |
| LNU820_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE655496_P1         | 1472              | 3496              | 564                | 86.4          | globlastp |
| LNU820_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE619575_P1         | 1473              | 3497              | 564                | 86.1          | globlastp |
| LNU820_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI014065M_P1 | 1474              | 3498              | 564                | 86.1          | globlastp |
| LNU820_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE619575           | 1475              | 3499              | 564                | 86.1          | globlastp |
| LNU820_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE655496           | 1476              | 3500              | 564                | 81.6          | globlastp |
| LNU820_H6                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G39210_P1    | 1477              | 3501              | 564                | 80.7          | globlastp |
| LNU822_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI011544M_P1 | 1478              | 3502              | 566                | 94.3          | globlastp |
| LNU822_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB06G001560             | 1479              | 3503              | 566                | 94.3          | globlastp |
| LNU822_H3                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA087712              | 1480              | 3503              | 566                | 94.3          | globlastp |
| LNU822_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA484262                  | 1481              | 3503              | 566                | 94.3          | globlastp |
| LNU822_H17                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL830389_P1         | 1482              | 3504              | 566                | 92.9          | globlastp |
| LNU822_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL830388           | 1483              | 3504              | 566                | 92.9          | globlastp |
| LNU822_H6                                                                                                                                                                                                                                                                                                     | cynodon 10v1 ES301162_P1             | 1484              | 3505              | 566                | 91.4          | globlastp |
| LNU822_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM225827_P1        | 1485              | 3506              | 566                | 91.4          | globlastp |
| LNU822_H18                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL830388_P1         | 1486              | 3507              | 566                | 90            | globlastp |
| LNU822_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI5G00560_P1    | 1487              | 3508              | 566                | 90            | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.     |
| LNU822_H9                                                                                                                                                                                                                                                                                                     | barley 12v1 BI949537_P1              | 1488              | 3509              | 566                | 88.6          | globlastp  |
| LNU822_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 AA750203                   | 1489              | 3510              | 566                | 88.6          | globlastp  |
| LNU822_H11                                                                                                                                                                                                                                                                                                    | cynodon 10v1 ES294723_T1             | 1490              | 3511              | 566                | 87.14         | glotblastn |
| LNU822_H12                                                                                                                                                                                                                                                                                                    | oat 11v1 GO594699_P1                 | 1491              | 3512              | 566                | 85.7          | globlastp  |
| LNU822_H13                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE490468                  | 1492              | 3513              | 566                | 85.7          | globlastp  |
| LNU822_H14                                                                                                                                                                                                                                                                                                    | wheat 12v3 BI751481                  | 1493              | 3513              | 566                | 85.7          | globlastp  |
| LNU822_H15                                                                                                                                                                                                                                                                                                    | oil_palm 11v1 SRR190699.168391_P1    | 1494              | 3514              | 566                | 81.4          | globlastp  |
| LNU822_H16                                                                                                                                                                                                                                                                                                    | zostera 10v1 SRR057351.S0024697      | 1495              | 3515              | 566                | 80            | globlastp  |
| LNU823_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB10G008020             | 1496              | 3516              | 567                | 96.4          | globlastp  |
| LNU823_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI861542_P1               | 1497              | 3517              | 567                | 92.7          | globlastp  |
| LNU823_H20                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE618890_P1         | 1498              | 3518              | 567                | 90.6          | globlastp  |
| LNU823_H21                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE626264_P1         | 1499              | 3518              | 567                | 90.6          | globlastp  |
| LNU823_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE618890           | 1500              | 3518              | 567                | 90.6          | globlastp  |
| LNU823_H4                                                                                                                                                                                                                                                                                                     | cynodon 10v1 ES300242_P1             | 1501              | 3519              | 567                | 89.6          | globlastp  |
| LNU823_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI007340M_P1 | 1502              | 3520              | 567                | 89.1          | globlastp  |
| LNU823_H6                                                                                                                                                                                                                                                                                                     | lovegrass gb167 EH186334_P1          | 1503              | 3521              | 567                | 87            | globlastp  |
| LNU823_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM084286_P1        | 1504              | 3522              | 567                | 86.5          | globlastp  |
| LNU823_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 BE230397                   | 1505              | 3523              | 567                | 86            | globlastp  |
| LNU823_H9                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA098201              | 1506              | 3524              | 567                | 84.9          | globlastp  |
| LNU823_H10                                                                                                                                                                                                                                                                                                    | leymus gb166 CD808583_P1             | 1507              | 3525              | 567                | 83.5          | globlastp  |
| LNU823_H11                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE416640                  | 1508              | 3526              | 567                | 83.5          | globlastp  |
| LNU823_H12                                                                                                                                                                                                                                                                                                    | pseudoroegneria gb167 FF347817       | 1509              | 3527              | 567                | 83            | globlastp  |
| LNU823_H13                                                                                                                                                                                                                                                                                                    | cenchrus gb166 EB656741_P1           | 1510              | 3528              | 567                | 82.8          | globlastp  |
| LNU823_H14                                                                                                                                                                                                                                                                                                    | barley 12v1 BE603265_P1              | 1511              | 3529              | 567                | 82.5          | globlastp  |
| LNU823_H15                                                                                                                                                                                                                                                                                                    | oat 11v1 GO588574_P1                 | 1512              | 3530              | 567                | 81.9          | globlastp  |
| LNU823_H16                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI1G45240_P1    | 1513              | 3531              | 567                | 81.8          | globlastp  |
| LNU823_H17                                                                                                                                                                                                                                                                                                    | rye 12v1 BE495527                    | 1514              | 3532              | 567                | 81.6          | globlastp  |
| LNU823_H18                                                                                                                                                                                                                                                                                                    | rye 12v1 BE587517                    | 1515              | 3532              | 567                | 81.6          | globlastp  |
| LNU823_H19                                                                                                                                                                                                                                                                                                    | lolium 10v1 ES700436_P1              | 1516              | 3533              | 567                | 80.3          | globlastp  |
| LNU824_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BE575106_P1               | 1517              | 3534              | 568                | 97.8          | globlastp  |
| LNU824_H5                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM005683_P1        | 1518              | 3535              | 568                | 95.2          | globlastp  |
| LNU824_H21                                                                                                                                                                                                                                                                                                    | maize 10v1 BE056872_P1               | 1519              | 3536              | 568                | 89.4          | globlastp  |
| LNU824_H27                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE400910                  | 1520              | 3537              | 568                | 88            | globlastp  |
| LNU824_H28                                                                                                                                                                                                                                                                                                    | wheat 12v3 SRR073322X587000D1        | 1521              | 3538              | 568                | 88            | globlastp  |
| LNU824_H29                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.606957            | 1522              | 3539              | 568                | 87.96         | glotblastn |
| LNU824_H30                                                                                                                                                                                                                                                                                                    | wheat 12v3 BQ483480                  | 1523              | 3540              | 568                | 87.7          | globlastp  |
| LNU824_H37                                                                                                                                                                                                                                                                                                    | poplar 10v1 BI139016                 | 1524              | 3541              | 568                | 81.3          | globlastp  |
| LNU824_H37                                                                                                                                                                                                                                                                                                    | poplar 13v1 BI139016_P1              | 1525              | 3541              | 568                | 81.3          | globlastp  |
| LNU824_H42                                                                                                                                                                                                                                                                                                    | tripterygium 11v1 SRR098677X102165   | 1526              | 3542              | 568                | 80.78         | glotblastn |
| LNU824_H47                                                                                                                                                                                                                                                                                                    | banana 12v1 MAGEN2012015228_P1       | 1527              | 3543              | 568                | 80.5          | globlastp  |
| LNU824_H49                                                                                                                                                                                                                                                                                                    | platanus 11v1 SRR096786X106999_T1    | 1528              | 3544              | 568                | 80.45         | glotblastn |
| LNU828_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G037440             | 1529              | 3545              | 570                | 93.9          | globlastp  |
| LNU828_H2                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA069736              | 1530              | 3546              | 570                | 93.3          | globlastp  |
| LNU828_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 BI991815_P1               | 1531              | 3547              | 570                | 88.2          | globlastp  |
| LNU828_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613572_P1      | 1532              | 3548              | 570                | 87.5          | globlastp  |
| LNU828_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE628831_P1         | 1533              | 3549              | 570                | 86.9          | globlastp  |
| LNU828_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE628831           | 1534              | 3549              | 570                | 86.9          | globlastp  |
| LNU828_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE635562_P1         | 1535              | 3550              | 570                | 86.6          | globlastp  |
| LNU828_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE635562           | 1536              | 3550              | 570                | 86.6          | globlastp  |
| LNU828_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM010680_P1        | 1537              | 3551              | 570                | 84.3          | globlastp  |
| LNU828_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 BF430629                   | 1538              | 3552              | 570                | 80.9          | globlastp  |
| LNU828_H9                                                                                                                                                                                                                                                                                                     | cenchrus gb166 BM084141_P1           | 1539              | 3553              | 570                | 80.8          | globlastp  |
| LNU829_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB10G002790             | 1540              | 3554              | 571                | 94.5          | globlastp  |
| LNU829_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI007445M_P1 | 1541              | 3555              | 571                | 93.8          | globlastp  |
| LNU700_H2                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE646787_T1         | 1542              | 3556              | 571                | 92.47         | glotblastn |
| LNU829_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL894055           | 1543              | —                 | 571                | 91.1          | glotblastn |
| LNU830_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB05G022780             | 1544              | 3557              | 572                | 96.9          | globlastp  |
| LNU830_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI025963M_P1 | 1545              | 3558              | 572                | 96.2          | globlastp  |
| LNU830_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 CD942361_P1               | 1546              | 3559              | 572                | 95.8          | globlastp  |
| LNU830_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL692292_T1         | 1547              | 3560              | 572                | 94.72         | glotblastn |
| LNU830_H14                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL694591_P1         | 1548              | 3561              | 572                | 94.5          | globlastp  |
| LNU830_H4                                                                                                                                                                                                                                                                                                     | rice 11v1 BE039844                   | 1549              | 3562              | 572                | 91.9          | globlastp  |
| LNU830_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G15130_P1    | 1550              | 3563              | 572                | 90.5          | globlastp  |
| LNU830_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.122402            | 1551              | 3564              | 572                | 89.7          | globlastp  |
| LNU830_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BJ292957                  | 1552              | 3565              | 572                | 89.6          | globlastp  |
| LNU830_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM046481_P1        | 1553              | 3566              | 572                | 88.7          | globlastp  |
| LNU830_H9                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR400820X1166902D1       | 1554              | 3567              | 572                | 88.31         | glotblastn |
| LNU830_H10                                                                                                                                                                                                                                                                                                    | wheat 12v3 CA640921                  | 1555              | 3568              | 572                | 86.1          | globlastp  |
| LNU830_H11                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001013.178186            | 1556              | 3569              | 572                | 85.62         | glotblastn |
| LNU830_H12                                                                                                                                                                                                                                                                                                    | wheat 12v3 BJ299341                  | 1557              | 3570              | 572                | 80.7          | globlastp  |
| LNU832_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL740797_T1         | 1558              | 3571              | 574                | 83.82         | glotblastn |
| LNU832_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI005129M_T1 | 1559              | 3572              | 574                | 83.82         | glotblastn |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                       |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                  | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU833_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE608977            | 1560              | 3573              | 575                | 87.3 globlastp       |
| LNU833_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL864642_P1          | 1561              | 3574              | 575                | 87.1 globlastp       |
| LNU834_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE628655_P1          | 1562              | 3575              | 576                | 88.5 globlastp       |
| LNU834_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL721897_P1          | 1563              | 3576              | 576                | 87.1 globlastp       |
| LNU834_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI032419M_P1  | 1564              | 3577              | 576                | 84.2 globlastp       |
| LNU835_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB03G036980              | 1565              | 3578              | 577                | 92.7 globlastp       |
| LNU835_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI001322M_P1  | 1566              | 3579              | 577                | 87.8 globlastp       |
| LNU835_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL816691_P1          | 1567              | 3580              | 577                | 86 globlastp         |
| LNU835_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 DN148836_T1          | 1568              | 3581              | 577                | 82.43 glotblastn     |
| LNU837_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA099580               | 1569              | 3582              | 578                | 93.6 globlastp       |
| LNU837_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G044830              | 1570              | 3583              | 578                | 89.7 globlastp       |
| LNU837_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI036841M_P1  | 1571              | 3584              | 578                | 81.3 globlastp       |
| LNU838_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB08G016060              | 1572              | 3585              | 579                | 81.4 globlastp       |
| LNU838_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI022177M_P1  | 1573              | 3586              | 579                | 80 globlastp         |
| LNU839_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G035480              | 1574              | 3587              | 580                | 94.7 globlastp       |
| LNU839_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL711007_P1          | 1575              | 3588              | 580                | 92.7 globlastp       |
| LNU839_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034579M_P1  | 1576              | 3589              | 580                | 90.9 globlastp       |
| LNU839_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL711007            | 1577              | 3590              | 580                | 90.26 glotblastn     |
| LNU839_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL913070_P1          | 1578              | 3591              | 580                | 88.6 globlastp       |
| LNU839_H4                                                                                                                                                                                                                                                                                                     | barley 12v1 AK365006_P1               | 1579              | 3592              | 580                | 83.1 globlastp       |
| LNU839_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 CI197575                    | 1580              | 3593              | 580                | 82.7 globlastp       |
| LNU840_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 GRMZM2G126856T01_T1        | 1581              | 3594              | 581                | 89.53 glotblastn     |
| LNU840_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G012580              | 1582              | 3595              | 581                | 83.58 glotblastn     |
| LNU840_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187767.717986_P1  | 1583              | 3596              | 581                | 82.2 globlastp       |
| LNU841_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB08G017100              | 1584              | 3597              | 582                | 94.3 globlastp       |
| LNU841_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 XM_002442210             | 1585              | 3597              | 582                | 94.3 globlastp       |
| LNU841_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI023738M_P1  | 1586              | 3598              | 582                | 93.3 globlastp       |
| LNU841_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI023743M_P1  | 1587              | 3599              | 582                | 93.3 globlastp       |
| LNU841_H17                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187766.726682_P1  | 1588              | 3600              | 582                | 92.3 globlastp       |
| LNU841_H5                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB08G01710               | 1589              | 3601              | 582                | 90.6 globlastp       |
| LNU841_H18                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187768.166352_P1  | 1590              | 3602              | 582                | 90.4 globlastp       |
| LNU841_H19                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL882657_P1          | 1591              | 3603              | 582                | 89.4 globlastp       |
| LNU841_H20                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187769.1407427_P1 | 1592              | 3604              | 582                | 86.7 globlastp       |
| LNU841_H6                                                                                                                                                                                                                                                                                                     | maize 10v1 GRMZM2G303536T01_P1        | 1593              | 3605              | 582                | 84.9 globlastp       |
| LNU841_H7                                                                                                                                                                                                                                                                                                     | cynodon 10v1 ES306830_P1              | 1594              | 3606              | 582                | 84.6 globlastp       |
| LNU841_H8                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA658370                   | 1595              | 3607              | 582                | 83.8 globlastp       |
| LNU841_H9                                                                                                                                                                                                                                                                                                     | barley 12v1 HV12v1CRP170116_P1        | 1596              | 3608              | 582                | 82.9 globlastp       |
| LNU841_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 BI118730                    | 1597              | 3609              | 582                | 82.9 globlastp       |
| LNU841_H11                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.239987             | 1598              | 3608              | 582                | 82.9 globlastp       |
| LNU841_H12                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI4G05620_P1     | 1599              | 3610              | 582                | 81.9 globlastp       |
| LNU841_H13                                                                                                                                                                                                                                                                                                    | cynodon 10v1 ES298100_P1              | 1600              | 3611              | 582                | 81.7 globlastp       |
| LNU841_H14                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.383938             | 1601              | 3612              | 582                | 81.7 globlastp       |
| LNU841_H21                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187771.1169651_P1 | 1602              | 3613              | 582                | 81.2 globlastp       |
| LNU841_H15                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI4G05650_P1     | 1603              | 3614              | 582                | 81 globlastp         |
| LNU841_H22                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187769.117822_P1  | 1604              | 3615              | 582                | 80.8 globlastp       |
| LNU841_H16                                                                                                                                                                                                                                                                                                    | pseudoroegneria gb167 FF355748        | 1605              | 3616              | 582                | 80.8 globlastp       |
| LNU843_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI005850M_P1  | 1606              | 3617              | 583                | 83.6 globlastp       |
| LNU843_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB10G014220              | 1607              | 3618              | 583                | 83.4 globlastp       |
| LNU843_H3                                                                                                                                                                                                                                                                                                     | barley 12v1 BJ449862_P1               | 1608              | 3619              | 583                | 80.1 globlastp       |
| LNU844_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB06G023170              | 1609              | 3620              | 584                | 86.7 globlastp       |
| LNU844_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE634672_P1          | 1610              | 3621              | 584                | 84 globlastp         |
| LNU844_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL828787_P1          | 1611              | 3622              | 584                | 83.7 globlastp       |
| LNU844_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE634672            | 1612              | 3623              | 584                | 83.6 globlastp       |
| LNU844_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI010995M_P1  | 1613              | 3624              | 584                | 81.3 globlastp       |
| LNU844_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM170895_P1         | 1614              | 3625              | 584                | 81 globlastp         |
| LNU844_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI5G16300_T1     | 1615              | 3626              | 584                | 80.59 glotblastn     |
| LNU844_H6                                                                                                                                                                                                                                                                                                     | maize 10v1 CF632136_P1                | 1616              | 3627              | 584                | 80 globlastp         |
| LNU845_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB02G039730              | 1617              | 3628              | 585                | 91 globlastp         |
| LNU890_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA092661               | 1618              | 3629              | 586                | 80.5 globlastp       |
| LNU890_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA092661               | 1618              | 3629              | 625                | 88.1 globlastp       |
| LNU849_H1                                                                                                                                                                                                                                                                                                     | rice 11v1 AF140491                    | 1619              | 3630              | 589                | 98.67 glotblastn     |
| LNU849_H2                                                                                                                                                                                                                                                                                                     | barley 12v1 BM443537_P1               | 1620              | 3631              | 589                | 87.5 globlastp       |
| LNU849_H3                                                                                                                                                                                                                                                                                                     | leymus gb166 EG396571_P1              | 1621              | 3632              | 589                | 87.5 globlastp       |
| LNU849_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 A1746262_P1                | 1622              | 3633              | 589                | 86.7 globlastp       |
| LNU849_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI002848M_P1  | 1623              | 3634              | 589                | 86.6 globlastp       |
| LNU849_H6                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF366817        | 1624              | 3635              | 589                | 86.6 globlastp       |
| LNU849_H7                                                                                                                                                                                                                                                                                                     | rye 12v1 BE587488                     | 1625              | 3636              | 589                | 86.6 globlastp       |
| LNU849_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.10525              | 1626              | 3636              | 589                | 86.6 globlastp       |
| LNU849_H9                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA065802               | 1627              | 3637              | 589                | 86.6 globlastp       |
| LNU849_H10                                                                                                                                                                                                                                                                                                    | wheat 12v3 BQ483162                   | 1628              | 3638              | 589                | 86.6 globlastp       |
| LNU849_H17                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE636162_P1          | 1629              | 3639              | 589                | 86.2 globlastp       |
| LNU849_H11                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB03G030650              | 1630              | 3640              | 589                | 86.2 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                        |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                   | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU849_H18                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE625302_P1           | 1631              | 3641              | 589                | 85.7          | globlastp |
| LNU849_H12                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE625301             | 1632              | 3642              | 589                | 85.7          | globlastp |
| LNU849_H13                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI2G46060_P1      | 1633              | 3643              | 589                | 85.3          | globlastp |
| LNU849_H14                                                                                                                                                                                                                                                                                                    | oat 11v1 GR357640_T1                   | 1634              | 3644              | 589                | 82.59         | globlastn |
| LNU849_H15                                                                                                                                                                                                                                                                                                    | millet 10v1 EVO454PM504671_P1          | 1635              | 3645              | 589                | 80.8          | globlastp |
| LNU849_H19                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL757304_T1           | 1636              | 3646              | 589                | 80.36         | globlastn |
| LNU849_H16                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FL757304             | 1637              | 3646              | 589                | 80.36         | globlastn |
| LNU850_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AI677001_P1                 | 1638              | 3647              | 590                | 80.2          | globlastp |
| LNU852_H1                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI5G21580_P1      | 1639              | 3648              | 592                | 82            | globlastp |
| LNU852_H2                                                                                                                                                                                                                                                                                                     | oat 11v1 GR321105_P1                   | 1640              | 3649              | 592                | 81.8          | globlastp |
| LNU852_H3                                                                                                                                                                                                                                                                                                     | barley 12v1 BF630808_P1                | 1641              | 3650              | 592                | 81.7          | globlastp |
| LNU852_H4                                                                                                                                                                                                                                                                                                     | pseudoroegneria gb167 FF354586         | 1642              | 3651              | 592                | 80.9          | globlastp |
| LNU852_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE403524                    | 1643              | 3652              | 592                | 80.7          | globlastp |
| LNU854_H1                                                                                                                                                                                                                                                                                                     | rice 11v1 AA752561                     | 1644              | 3653              | 594                | 95.94         | globlastn |
| LNU854_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AW330902_P1                 | 1645              | 3654              | 594                | 90.8          | globlastp |
| LNU854_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G007880               | 1646              | 3655              | 594                | 90.8          | globlastp |
| LNU854_H22                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE619859_P1           | 1647              | 3656              | 594                | 90.1          | globlastp |
| LNU854_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 BG604569                    | 1648              | 3657              | 594                | 90            | globlastp |
| LNU854_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.108381              | 1649              | 3658              | 594                | 87.99         | globlastn |
| LNU854_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE619859             | 1650              | 3659              | 594                | 87.8          | globlastp |
| LNU854_H7                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034415M_P1   | 1651              | 3660              | 594                | 86.4          | globlastp |
| LNU854_H8                                                                                                                                                                                                                                                                                                     | banana 12v1 GFXAC186756X17_P1          | 1652              | 3661              | 594                | 82.9          | globlastp |
| LNU854_H9                                                                                                                                                                                                                                                                                                     | banana 12v1 BBS110T3_P1                | 1653              | 3662              | 594                | 82.7          | globlastp |
| LNU854_H10                                                                                                                                                                                                                                                                                                    | banana 12v1 MAGEN2012031765_T1         | 1654              | 3663              | 594                | 81.24         | globlastn |
| LNU854_H11                                                                                                                                                                                                                                                                                                    | oak 10v1 CU640269_P1                   | 1655              | 3664              | 594                | 80.3          | globlastp |
| LNU854_H12                                                                                                                                                                                                                                                                                                    | arabidopsis_lyrata 09v1 JGLAL026584_P1 | 1656              | 3665              | 594                | 80.2          | globlastp |
| LNU854_H13                                                                                                                                                                                                                                                                                                    | b_juncea 12v1 E6ANDIZ01BGQGU_P1        | 1657              | 3666              | 594                | 80.2          | globlastp |
| LNU854_H14                                                                                                                                                                                                                                                                                                    | b_rapa 11v1 CD832802_P1                | 1658              | 3666              | 594                | 80.2          | globlastp |
| LNU854_H15                                                                                                                                                                                                                                                                                                    | canola 11v1 EE459921_P1                | 1659              | 3666              | 594                | 80.2          | globlastp |
| LNU854_H16                                                                                                                                                                                                                                                                                                    | eucalyptus 11v2 SRR001659X91383_P1     | 1660              | 3667              | 594                | 80.2          | globlastp |
| LNU854_H17                                                                                                                                                                                                                                                                                                    | b_juncea 12v1 AJ561120_P1              | 1661              | 3668              | 594                | 80.1          | globlastp |
| LNU854_H18                                                                                                                                                                                                                                                                                                    | phalaenopsis 11v1 SRR125771.100605_P1  | 1662              | 3669              | 594                | 80.1          | globlastp |
| LNU854_H19                                                                                                                                                                                                                                                                                                    | arabidopsis 10v1 AT4G16370_T1          | 1663              | 3670              | 594                | 80.05         | globlastn |
| LNU854_H20                                                                                                                                                                                                                                                                                                    | solanum_phureja 09v1 SPHAI774365       | 1664              | 3671              | 594                | 80.05         | globlastn |
| LNU854_H21                                                                                                                                                                                                                                                                                                    | thellungiella_parvulum 11v1 BY803192   | 1665              | 3672              | 594                | 80            | globlastn |
| LNU856_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE644937             | 1666              | 3673              | 595                | 91.45         | globlastn |
| LNU856_H7                                                                                                                                                                                                                                                                                                     | maize 10v1 BM896061_P1                 | 1667              | 3674              | 595                | 87.9          | globlastp |
| LNU861_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI013407M_T1   | 1668              | 3675              | 598                | 97.26         | globlastn |
| LNU861_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 CD438306_T1                 | 1669              | 3676              | 598                | 94.32         | globlastn |
| LNU861_H4                                                                                                                                                                                                                                                                                                     | rice 11v1 CK071575                     | 1670              | 3677              | 598                | 89.82         | globlastn |
| LNU861_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 SOLX00081332                 | 1671              | 3677              | 598                | 89.82         | globlastn |
| LNU861_H6                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G37580_T1      | 1672              | 3678              | 598                | 89.67         | globlastn |
| LNU861_H7                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.202554              | 1673              | 3679              | 598                | 89.28         | globlastn |
| LNU861_H8                                                                                                                                                                                                                                                                                                     | barley 12v1 CA028638_T1                | 1674              | 3680              | 598                | 89.24         | globlastn |
| LNU861_H9                                                                                                                                                                                                                                                                                                     | rice 11v1 CA756830                     | 1675              | 3681              | 598                | 82.97         | globlastn |
| LNU861_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 CK008076                     | 1676              | 3682              | 598                | 82.97         | globlastn |
| LNU861_H11                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI031891M_T1   | 1677              | 3683              | 598                | 82.36         | globlastn |
| LNU861_H12                                                                                                                                                                                                                                                                                                    | wheat 12v3 SRR073321X296640D1          | 1678              | 3684              | 598                | 81.5          | globlastp |
| LNU861_H13                                                                                                                                                                                                                                                                                                    | barley 12v1 CA008529_T1                | 1679              | 3685              | 598                | 81.41         | globlastn |
| LNU861_H14                                                                                                                                                                                                                                                                                                    | maize 10v1 DN222557_T1                 | 1680              | 3686              | 598                | 80.93         | globlastn |
| LNU861_H15                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI4G31270_T1      | 1681              | 3687              | 598                | 80.58         | globlastn |
| LNU861_H16                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB02G025750               | 1682              | 3688              | 598                | 80.5          | globlastn |
| LNU861_H17                                                                                                                                                                                                                                                                                                    | maize 10v1 EE160122_T1                 | 1683              | 3689              | 598                | 80.15         | globlastn |
| LNU862_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB08G001030               | 1684              | 3690              | 599                | 94.5          | globlastp |
| LNU862_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI009715M_P1   | 1685              | 3691              | 599                | 93.8          | globlastp |
| LNU862_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL705388             | 1686              | 3692              | 599                | 93.7          | globlastp |
| LNU862_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE626506_P1           | 1687              | 3693              | 599                | 93.3          | globlastp |
| LNU862_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI026163M_P1   | 1688              | 3694              | 599                | 92.8          | globlastp |
| LNU862_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM031355_P1          | 1689              | 3695              | 599                | 91.9          | globlastp |
| LNU862_H5                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM017321_P1          | 1690              | 3696              | 599                | 90.2          | globlastp |
| LNU862_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 CO449955_P1                 | 1691              | 3697              | 599                | 89.5          | globlastp |
| LNU862_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 BI806647                     | 1692              | 3698              | 599                | 87.7          | globlastp |
| LNU862_H9                                                                                                                                                                                                                                                                                                     | rice 11v1 CK041467                     | 1693              | 3699              | 599                | 86.82         | globlastn |
| LNU862_H12                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE424023                    | 1694              | 3700              | 599                | 82.5          | globlastp |
| LNU862_H11                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI4G26590_P1      | 1695              | 3701              | 599                | 82.3          | globlastp |
| LNU862_H14                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.223104              | 1696              | 3702              | 599                | 82            | globlastp |
| LNU864_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA284192                | 1697              | 3703              | 600                | 88.1          | globlastp |
| LNU864_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BG841837_P1                 | 1698              | 3704              | 600                | 83.3          | globlastp |
| LNU864_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 BM074912_P1                 | 1699              | 3705              | 600                | 82            | globlastp |
| LNU864_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL763699             | 1700              | 3706              | 600                | 82            | globlastp |
| LNU864_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL763699_T1           | 1701              | 3707              | 600                | 81.97         | globlastn |
| LNU864_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI003614M_T1   | 1702              | 3708              | 600                | 80            | globlastn |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU864_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 SOLX00021347_T1  | 1703              | —                 | 600                | 80 glotblastn        |
| LNU865_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL867036_P1         | 1704              | 3709              | 601                | 90.7 globlastp       |
| LNU865_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL693600_P1         | 1705              | 3710              | 601                | 90.1 globlastp       |
| LNU865_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI019927M_P1 | 1706              | 3711              | 601                | 89.6 globlastp       |
| LNU865_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AW056335_P1               | 1707              | 3712              | 601                | 87 globlastp         |
| LNU865_H3                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G55730_P1    | 1708              | 3713              | 601                | 80.6 globlastp       |
| LNU867_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AI622284_P1               | 1709              | 3714              | 603                | 95.4 globlastp       |
| LNU867_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034422M_P1 | 1710              | 3715              | 603                | 91.4 globlastp       |
| LNU867_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE639293_P1         | 1711              | 3716              | 603                | 88.8 globlastp       |
| LNU867_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 AU065908                   | 1712              | 3717              | 603                | 85.1 globlastp       |
| LNU867_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G04830_P1    | 1713              | 3718              | 603                | 84.5 globlastp       |
| LNU867_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.163223            | 1714              | 3719              | 603                | 83.4 globlastp       |
| LNU867_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 DN143060_T1         | 1715              | 3720              | 603                | 80.57 glotblastn     |
| LNU868_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA093083              | 1716              | 3721              | 604                | 89.96 glotblastn     |
| LNU868_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 A947616_P1                | 1717              | 3722              | 604                | 89.2 globlastp       |
| LNU868_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL739389_P1         | 1718              | 3723              | 604                | 88.8 globlastp       |
| LNU868_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI037194M_P1 | 1719              | 3724              | 604                | 88.8 globlastp       |
| LNU868_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL739389           | 1720              | 3723              | 604                | 88.8 globlastp       |
| LNU868_H5                                                                                                                                                                                                                                                                                                     | cenchrus gb166 BM084505_P1           | 1721              | 3725              | 604                | 88 globlastp         |
| LNU868_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL693838           | 1722              | 3726              | 604                | 88 globlastp         |
| LNU868_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL693838_T1         | 1723              | 3727              | 604                | 87.95 glotblastn     |
| LNU868_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 PMSLX0030911D1_P1        | 1724              | 3728              | 604                | 86.7 globlastp       |
| LNU868_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 OSU16747                   | 1725              | 3729              | 604                | 80.6 globlastp       |
| LNU869_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BM266786_T1               | 1726              | 3730              | 605                | 84.71 glotblastn     |
| LNU870_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 CB616889_P1               | 1727              | 3731              | 606                | 93.7 globlastp       |
| LNU870_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL933190_P1         | 1728              | 3732              | 606                | 89.8 globlastp       |
| LNU870_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL689654_P1         | 1729              | 3733              | 606                | 89 globlastp         |
| LNU870_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 DR811947_P1               | 1730              | 3734              | 606                | 87.3 globlastp       |
| LNU870_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G07390_P1    | 1731              | 3735              | 606                | 83.6 globlastp       |
| LNU870_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 GFXAC107207X23_P1          | 1732              | 3736              | 606                | 80.8 globlastp       |
| LNU871_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA073953              | 1733              | 3737              | 607                | 97.59 glotblastn     |
| LNU871_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 H35900_P1                 | 1734              | 3738              | 607                | 97 globlastp         |
| LNU871_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI035239M_P1 | 1735              | 3739              | 607                | 92.2 globlastp       |
| LNU871_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM012409_P1        | 1736              | 3740              | 607                | 90.8 globlastp       |
| LNU871_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G38220_P1    | 1737              | 3741              | 607                | 88.8 globlastp       |
| LNU871_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN150454           | 1738              | 3742              | 607                | 88.2 globlastp       |
| LNU871_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN150454_P1         | 1739              | 3743              | 607                | 88 globlastp         |
| LNU871_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA663733                  | 1740              | 3744              | 607                | 84.8 globlastp       |
| LNU871_H8                                                                                                                                                                                                                                                                                                     | wheat 12v3 BQ240433                  | 1741              | 3745              | 607                | 84.6 globlastp       |
| LNU871_H9                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.137460            | 1742              | 3746              | 607                | 84.34 glotblastn     |
| LNU872_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA074015              | 1743              | 3747              | 608                | 99 globlastp         |
| LNU872_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA486412                  | 1744              | 3748              | 608                | 99 globlastp         |
| LNU872_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 T70637_P1                 | 1745              | 3749              | 608                | 96.7 globlastp       |
| LNU872_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 A1714486_P1               | 1746              | 3750              | 608                | 95.7 globlastp       |
| LNU872_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL766492           | 1747              | 3751              | 608                | 94.4 globlastp       |
| LNU872_H6                                                                                                                                                                                                                                                                                                     | cenchrus gb166 BM083980_P1           | 1748              | 3752              | 608                | 93.9 globlastp       |
| LNU872_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 CD724561_P1              | 1749              | 3753              | 608                | 93.9 globlastp       |
| LNU872_H8                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI037482M_P1 | 1750              | 3754              | 608                | 92.9 globlastp       |
| LNU872_H9                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE626012           | 1751              | 3755              | 608                | 91.6 globlastp       |
| LNU872_H10                                                                                                                                                                                                                                                                                                    | oat 11v1 GO591754_P1                 | 1752              | 3756              | 608                | 88.7 globlastp       |
| LNU872_H11                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.107218XX1         | 1753              | 3757              | 608                | 88.7 globlastp       |
| LNU872_H12                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.112003            | 1754              | 3757              | 608                | 88.7 globlastp       |
| LNU872_H13                                                                                                                                                                                                                                                                                                    | cynodon 10v1 ES292020_P1             | 1755              | 3758              | 608                | 88.6 globlastp       |
| LNU872_H14                                                                                                                                                                                                                                                                                                    | rice 11v1 BI806552                   | 1756              | 3759              | 608                | 88.3 globlastp       |
| LNU872_H15                                                                                                                                                                                                                                                                                                    | barley 12v1 BE412496_P1              | 1757              | 3760              | 608                | 87.8 globlastp       |
| LNU872_H16                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE430362                  | 1758              | 3761              | 608                | 87.8 globlastp       |
| LNU872_H17                                                                                                                                                                                                                                                                                                    | pseudoroegneria gb167 FF346564       | 1759              | 3762              | 608                | 87.3 globlastp       |
| LNU872_H18                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI1G11830_P1    | 1760              | 3763              | 608                | 87.1 globlastp       |
| LNU872_H19                                                                                                                                                                                                                                                                                                    | lovegrass gb167 EH183935_T1          | 1761              | 3764              | 608                | 85.51 glotblastn     |
| LNU873_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 CD969989_P1               | 1762              | 3765              | 609                | 88.7 globlastp       |
| LNU873_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI038649M_P1 | 1763              | 3766              | 609                | 83.1 globlastp       |
| LNU873_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL842367_T1         | 1764              | 3767              | 609                | 82.55 glotblastn     |
| LNU873_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL842366_P1         | 1765              | 3768              | 609                | 82.1 globlastp       |
| LNU873_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 SIPRD087917_T1   | 1766              | 3769              | 609                | 81.03 glotblastn     |
| LNU874_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW308694_P1               | 1767              | 3770              | 610                | 97 globlastp         |
| LNU874_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI033940M_P1 | 1768              | 3771              | 610                | 93.6 globlastp       |
| LNU874_H3                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G15377_P1    | 1769              | 3772              | 610                | 88.1 globlastp       |
| LNU874_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 BM137286                  | 1770              | 3773              | 610                | 87.6 globlastp       |
| LNU874_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 BI797720                   | 1771              | 3774              | 610                | 86.3 globlastp       |
| LNU874_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR043326X71705D1         | 1772              | 3775              | 610                | 80.7 globlastp       |
| LNU875_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AI600310_P1               | 1773              | 3776              | 611                | 96.3 globlastp       |
| LNU875_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034375M_P1 | 1774              | 3777              | 611                | 92.2 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU875_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL692975_P1         | 1775              | 3778              | 611                | 91.7 globlastp       |
| LNU875_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 GFXAC025296X19             | 1776              | 3779              | 611                | 86.9 globlastp       |
| LNU875_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.181409            | 1777              | 3780              | 611                | 86.3 globlastp       |
| LNU875_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA609528                  | 1778              | 3781              | 611                | 86.2 globlastp       |
| LNU875_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 CJ953973                  | 1779              | 3782              | 611                | 86.2 globlastp       |
| LNU875_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE417057                  | 1780              | 3783              | 611                | 85.8 globlastp       |
| LNU875_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G30830_P1    | 1781              | 3784              | 611                | 84.5 globlastp       |
| LNU878_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI038002M_P1 | 1782              | 3785              | 613                | 96.2 globlastp       |
| LNU878_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BE511455_P1               | 1783              | 3786              | 613                | 95.5 globlastp       |
| LNU878_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN141295_P1         | 1784              | 3787              | 613                | 94.7 globlastp       |
| LNU878_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 A947516_P1                | 1785              | 3788              | 613                | 94.7 globlastp       |
| LNU878_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM069646_P1        | 1786              | 3789              | 613                | 94.7 globlastp       |
| LNU878_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN141295           | 1787              | 3787              | 613                | 94.7 globlastp       |
| LNU878_H6                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA084602              | 1788              | 3790              | 613                | 94 globlastp         |
| LNU878_H7                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE658531           | 1789              | 3791              | 613                | 94 globlastp         |
| LNU878_H8                                                                                                                                                                                                                                                                                                     | cenchrus gb166 EB665787_T1           | 1790              | 3792              | 613                | 90.98 globlastn      |
| LNU878_H9                                                                                                                                                                                                                                                                                                     | rice 11v1 BE040893                   | 1791              | 3793              | 613                | 84.4 globlastp       |
| LNU878_H10                                                                                                                                                                                                                                                                                                    | pseudoroegneria gb167 FF366886       | 1792              | 3794              | 613                | 82.2 globlastp       |
| LNU878_H11                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI1G62860_P1    | 1793              | 3795              | 613                | 81.6 globlastp       |
| LNU878_H12                                                                                                                                                                                                                                                                                                    | barley 12v1 BE455249_P1              | 1794              | 3796              | 613                | 80.9 globlastp       |
| LNU878_H13                                                                                                                                                                                                                                                                                                    | pseudoroegneria gb167 FF349713       | 1795              | 3797              | 613                | 80.9 globlastp       |
| LNU878_H14                                                                                                                                                                                                                                                                                                    | rye 12v1 BE636984                    | 1796              | 3798              | 613                | 80.7 globlastp       |
| LNU878_H15                                                                                                                                                                                                                                                                                                    | wheat 12v3 CA655678                  | 1797              | 3799              | 613                | 80.7 globlastp       |
| LNU879_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA 12170              | 1798              | 3800              | 614                | 96.8 globlastp       |
| LNU879_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BG517175_P1               | 1799              | 3801              | 614                | 95.5 globlastp       |
| LNU879_H3                                                                                                                                                                                                                                                                                                     | cynodon 10v1 ES301377_P1             | 1800              | 3802              | 614                | 89 globlastp         |
| LNU879_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE426554                  | 1801              | 3803              | 614                | 84 globlastp         |
| LNU879_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 HO253185_T1         | 1802              | 3804              | 614                | 83.18 globlastn      |
| LNU879_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 BI306445                   | 1803              | 3805              | 614                | 83 globlastp         |
| LNU879_H6                                                                                                                                                                                                                                                                                                     | barley 12v1 BJ454262_P1              | 1804              | 3806              | 614                | 82.2 globlastp       |
| LNU879_H7                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G67110_P1    | 1805              | 3807              | 614                | 81.7 globlastp       |
| LNU880_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA065186              | 1806              | 3808              | 615                | 96.5 globlastp       |
| LNU880_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI600362_P1               | 1807              | 3809              | 615                | 95.1 globlastp       |
| LNU880_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI035863M_P1 | 1808              | 3810              | 615                | 94.3 globlastp       |
| LNU880_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE601297_P1         | 1809              | 3811              | 615                | 93.6 globlastp       |
| LNU880_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE601297           | 1810              | 3812              | 615                | 92.9 globlastp       |
| LNU880_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL761681_P1         | 1811              | 3813              | 615                | 91.7 globlastp       |
| LNU880_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G74650_P1    | 1812              | 3814              | 615                | 82.6 globlastp       |
| LNU880_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 BM037902                   | 1813              | 3815              | 615                | 82.6 globlastp       |
| LNU880_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BF483896                  | 1814              | 3816              | 615                | 81.9 globlastp       |
| LNU880_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.109304            | 1815              | 3817              | 615                | 81.4 globlastp       |
| LNU880_H9                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.101331            | 1816              | 3818              | 615                | 81.2 globlastp       |
| LNU881_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AI622122_P1               | 1817              | 3819              | 616                | 88.2 globlastp       |
| LNU881_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034179M_P1 | 1818              | 3820              | 616                | 83 globlastp         |
| LNU881_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE597492_P1         | 1819              | 3821              | 616                | 80.5 globlastp       |
| LNU882_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BM072852_P1               | 1820              | 3822              | 617                | 93.7 globlastp       |
| LNU882_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612475_P1      | 1821              | 3823              | 617                | 91.9 globlastp       |
| LNU882_H3                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM047888_P1        | 1822              | 3824              | 617                | 91.5 globlastp       |
| LNU882_H4                                                                                                                                                                                                                                                                                                     | rice 11v1 BI796737                   | 1823              | 3825              | 617                | 89.4 globlastp       |
| LNU882_H5                                                                                                                                                                                                                                                                                                     | barley 12v1 BF064865_P1              | 1824              | 3826              | 617                | 88.1 globlastp       |
| LNU882_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.119640            | 1825              | 3827              | 617                | 87.6 globlastp       |
| LNU882_H7                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G76280_P1    | 1826              | 3828              | 617                | 86.5 globlastp       |
| LNU883_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034726M_P1 | 1827              | 3829              | 618                | 95.2 globlastp       |
| LNU883_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 CO529769_P1               | 1828              | 3830              | 618                | 94.7 globlastp       |
| LNU883_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 BI803402                   | 1829              | 3831              | 618                | 91 globlastp         |
| LNU883_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G76640_T1    | 1830              | 3832              | 618                | 84.29 globlastn      |
| LNU883_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 CJ904265                  | 1831              | 3833              | 618                | 82.1 globlastp       |
| LNU884_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AI666123_P1               | 1832              | 3834              | 619                | 91.8 globlastp       |
| LNU884_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL810399_P1         | 1833              | 3835              | 619                | 87.6 globlastp       |
| LNU884_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL692715           | 1834              | 3836              | 619                | 87.6 globlastp       |
| LNU884_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL692715_P1         | 1835              | 3837              | 619                | 86.6 globlastp       |
| LNU884_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613926_P1      | 1836              | 3838              | 619                | 85.9 globlastp       |
| LNU885_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AA979999_P1               | 1837              | 3839              | 620                | 98.9 globlastp       |
| LNU885_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI932058_P1               | 1838              | 3840              | 620                | 98.3 globlastp       |
| LNU885_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE598943           | 1839              | 3841              | 620                | 98.1 globlastp       |
| LNU885_H156                                                                                                                                                                                                                                                                                                   | switchgrass 12v1 FE598943_P1         | 1840              | 3842              | 620                | 97.9 globlastp       |
| LNU885_H4                                                                                                                                                                                                                                                                                                     | cenchrus gb166 EB653919_P1           | 1841              | 3843              | 620                | 97.9 globlastp       |
| LNU885_H5                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB10G022220             | 1842              | 3844              | 620                | 97.9 globlastp       |
| LNU885_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI006215M_P1 | 1843              | 3845              | 620                | 97.8 globlastp       |
| LNU885_H157                                                                                                                                                                                                                                                                                                   | switchgrass 12v1 FE604237_P1         | 1844              | 3846              | 620                | 97.6 globlastp       |
| LNU885_H7                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI029447M_P1 | 1845              | 3847              | 620                | 97.6 globlastp       |
| LNU885_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM002715_P1        | 1846              | 3848              | 620                | 97.6 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                         |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                    | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU885_H158                                                                                                                                                                                                                                                                                                   | switchgrass 12v1 FE617027_P1            | 1847              | 3849              | 620                | 97.2 globlastp       |
| LNU885_H9                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE617027              | 1848              | 3849              | 620                | 97.2 globlastp       |
| LNU885_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 AA753506                      | 1849              | 3850              | 620                | 95.7 globlastp       |
| LNU885_H11                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI1G37790_P1       | 1850              | 3851              | 620                | 94.6 globlastp       |
| LNU885_H12                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI3G33860_P1       | 1851              | 3852              | 620                | 93.1 globlastp       |
| LNU885_H159                                                                                                                                                                                                                                                                                                   | switchgrass 12v1 FE603637_P1            | 1852              | 3853              | 620                | 92.3 globlastp       |
| LNU885_H13                                                                                                                                                                                                                                                                                                    | strawberry 11v1 CO381502                | 1853              | 3854              | 620                | 92.3 globlastp       |
| LNU885_H14                                                                                                                                                                                                                                                                                                    | oat 11v1 CN815217_P1                    | 1854              | 3855              | 620                | 92.1 globlastp       |
| LNU885_H15                                                                                                                                                                                                                                                                                                    | potato 10v1 BG593674_P1                 | 1855              | 3856              | 620                | 92.1 globlastp       |
| LNU885_H16                                                                                                                                                                                                                                                                                                    | tomato 11v1 BG129608                    | 1856              | 3857              | 620                | 92.1 globlastp       |
| LNU885_H17                                                                                                                                                                                                                                                                                                    | liriodendron gb166 CK755344_P1          | 1857              | 3858              | 620                | 92 globlastp         |
| LNU885_H18                                                                                                                                                                                                                                                                                                    | oat 11v1 CN817660_P1                    | 1858              | 3859              | 620                | 92 globlastp         |
| LNU885_H19                                                                                                                                                                                                                                                                                                    | oil_palm 11v1 EL684287_P1               | 1859              | 3860              | 620                | 92 globlastp         |
| LNU885_H20                                                                                                                                                                                                                                                                                                    | tobacco gb162 BQ842866                  | 1860              | 3861              | 620                | 92 globlastp         |
| LNU885_H21                                                                                                                                                                                                                                                                                                    | watermelon 11v1 X85013                  | 1861              | 3862              | 620                | 92 globlastp         |
| LNU885_H160                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana 12v1 EB446376_P1    | 1862              | 3863              | 620                | 91.8 globlastp       |
| LNU885_H22                                                                                                                                                                                                                                                                                                    | cucumber 09v1 X85013_P1                 | 1863              | 3864              | 620                | 91.8 globlastp       |
| LNU885_H23                                                                                                                                                                                                                                                                                                    | rye 12v1 BG264101                       | 1864              | 3865              | 620                | 91.8 globlastp       |
| LNU885_H24                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.133776               | 1865              | 3865              | 620                | 91.8 globlastp       |
| LNU885_H25                                                                                                                                                                                                                                                                                                    | solanum_phureja 09v1 SPHBG129608        | 1866              | 3866              | 620                | 91.6 globlastp       |
| LNU885_H26                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE404507                     | 1867              | 3867              | 620                | 91.6 globlastp       |
| LNU885_H27                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE406710                     | 1868              | 3867              | 620                | 91.6 globlastp       |
| LNU885_H161                                                                                                                                                                                                                                                                                                   | prunus_mume 13v1 BU044204_P1            | 1869              | 3868              | 620                | 91.4 globlastp       |
| LNU885_H28                                                                                                                                                                                                                                                                                                    | aristolochia 10v1 SRR039082S0002361_T1  | 1870              | 3869              | 620                | 91.4 globlastp       |
| LNU885_H29                                                                                                                                                                                                                                                                                                    | eucalyptus 11v2 CD669053_P1             | 1871              | 3870              | 620                | 91.4 globlastp       |
| LNU885_H30                                                                                                                                                                                                                                                                                                    | oil_palm 11v1 EL681083_P1               | 1872              | 3871              | 620                | 91.4 globlastp       |
| LNU885_H31                                                                                                                                                                                                                                                                                                    | peanut 10v1 EE126045_P1                 | 1873              | 3872              | 620                | 91.4 globlastp       |
| LNU885_H32                                                                                                                                                                                                                                                                                                    | phalaenopsis 11v1 CB032203XX1_P1        | 1874              | 3873              | 620                | 91.4 globlastp       |
| LNU885_H162                                                                                                                                                                                                                                                                                                   | monkeyflower 12v1 DV206835_P1           | 1875              | 3874              | 620                | 91.2 globlastp       |
| LNU885_H33                                                                                                                                                                                                                                                                                                    | amorphophallus 11v2 SRR089351X173078_P1 | 1876              | 3875              | 620                | 91.2 globlastp       |
| LNU885_H34                                                                                                                                                                                                                                                                                                    | catharanthus 11v1 SRR098691X112848_P1   | 1877              | 3876              | 620                | 91.2 globlastp       |
| LNU885_H35                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149229.103924_P1       | 1878              | 3877              | 620                | 91.2 globlastp       |
| LNU885_H36                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149229.114493_P1       | 1879              | 3877              | 620                | 91.2 globlastp       |
| LNU885_H37                                                                                                                                                                                                                                                                                                    | monkeyflower 10v1 DV206835              | 1880              | 3874              | 620                | 91.2 globlastp       |
| LNU885_H38                                                                                                                                                                                                                                                                                                    | oak 10v1 DN950673_P1                    | 1881              | 3878              | 620                | 91.2 globlastp       |
| LNU885_H39                                                                                                                                                                                                                                                                                                    | plantago 11v2 SRR066373X102202_P1       | 1882              | 3879              | 620                | 91.2 globlastp       |
| LNU885_H40                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE403876                     | 1883              | 3880              | 620                | 91.2 globlastp       |
| LNU885_H41                                                                                                                                                                                                                                                                                                    | banana 12v1 BBS440T3_P1                 | 1884              | 3881              | 620                | 91 globlastp         |
| LNU885_H42                                                                                                                                                                                                                                                                                                    | cacao 10v1 CA796831_P1                  | 1885              | 3882              | 620                | 91 globlastp         |
| LNU885_H43                                                                                                                                                                                                                                                                                                    | cassava 09v1 CK643413_P1                | 1886              | 3883              | 620                | 91 globlastp         |
| LNU885_H44                                                                                                                                                                                                                                                                                                    | chestnut gb170 SRR006295S0006601_P1     | 1887              | 3884              | 620                | 91 globlastp         |
| LNU885_H45                                                                                                                                                                                                                                                                                                    | cirsium 11v1 SRR346952.128271_P1        | 1888              | 3885              | 620                | 91 globlastp         |
| LNU885_H46                                                                                                                                                                                                                                                                                                    | lettuce 12v1 DW044389_P1                | 1889              | 3886              | 620                | 91 globlastp         |
| LNU885_H47                                                                                                                                                                                                                                                                                                    | prunus 10v1 BU044204                    | 1890              | 3887              | 620                | 91 globlastp         |
| LNU885_H48                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE604237              | 1891              | 3888              | 620                | 91 globlastp         |
| LNU885_H163                                                                                                                                                                                                                                                                                                   | castorbean 12v1 T15265_P1               | 1892              | 3889              | 620                | 90.8 globlastp       |
| LNU885_H49                                                                                                                                                                                                                                                                                                    | artemisia 10v1 EY033790_P1              | 1893              | 3890              | 620                | 90.8 globlastp       |
| LNU885_H50                                                                                                                                                                                                                                                                                                    | cassava 09v1 CK647990_P1                | 1894              | 3891              | 620                | 90.8 globlastp       |
| LNU885_H51                                                                                                                                                                                                                                                                                                    | castorbean 11v1 T15265                  | 1895              | 3889              | 620                | 90.8 globlastp       |
| LNU885_H52                                                                                                                                                                                                                                                                                                    | euphorbia 11v1 AW990924_P1              | 1896              | 3892              | 620                | 90.8 globlastp       |
| LNU885_H53                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149232.246685_P1       | 1897              | 3893              | 620                | 90.8 globlastp       |
| LNU885_H54                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 DT557120_P1    | 1898              | 3894              | 620                | 90.8 globlastp       |
| LNU885_H55                                                                                                                                                                                                                                                                                                    | grape 11v1 BM437210_P1                  | 1899              | 3895              | 620                | 90.8 globlastp       |
| LNU885_H56                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA11G37630              | 1900              | 3896              | 620                | 90.8 globlastp       |
| LNU885_H56                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA11G37630_P1           | 1901              | 3896              | 620                | 90.8 globlastp       |
| LNU885_H164                                                                                                                                                                                                                                                                                                   | olea 13v1 SRR014463X51856D1_P1          | 1902              | 3897              | 620                | 90.7 globlastp       |
| LNU885_H57                                                                                                                                                                                                                                                                                                    | apple 11v1 CN490098_P1                  | 1903              | 3898              | 620                | 90.7 globlastp       |
| LNU885_H58                                                                                                                                                                                                                                                                                                    | clementine 11v1 CF417075_P1             | 1904              | 3899              | 620                | 90.7 globlastp       |
| LNU885_H59                                                                                                                                                                                                                                                                                                    | cotton 11v1 AI054652_P1                 | 1905              | 3900              | 620                | 90.7 globlastp       |
| LNU885_H60                                                                                                                                                                                                                                                                                                    | orange 11v1 CF417075_P1                 | 1906              | 3899              | 620                | 90.7 globlastp       |
| LNU885_H61                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA18G01580              | 1907              | 3901              | 620                | 90.7 globlastp       |
| LNU885_H61                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA18G01580_P1           | 1908              | 3901              | 620                | 90.7 globlastp       |
| LNU885_H62                                                                                                                                                                                                                                                                                                    | amborella 12v3 FD432979_P1              | 1909              | 3902              | 620                | 90.5 globlastp       |
| LNU885_H63                                                                                                                                                                                                                                                                                                    | amsonia 11v1 SRR098688X101304_P1        | 1910              | 3903              | 620                | 90.5 globlastp       |
| LNU885_H64                                                                                                                                                                                                                                                                                                    | apple 11v1 CN489384_P1                  | 1911              | 3904              | 620                | 90.5 globlastp       |
| LNU885_H65                                                                                                                                                                                                                                                                                                    | aquilegia 10v2 DR937313_P1              | 1912              | 3905              | 620                | 90.5 globlastp       |
| LNU885_H66                                                                                                                                                                                                                                                                                                    | centaurea gb166 EH713231_P1             | 1913              | 3906              | 620                | 90.5 globlastp       |
| LNU885_H67                                                                                                                                                                                                                                                                                                    | cichorium gb171 EH673881_P1             | 1914              | 3907              | 620                | 90.5 globlastp       |
| LNU885_H68                                                                                                                                                                                                                                                                                                    | cirsium 11v1 SRR346952.1001022_P1       | 1915              | 3906              | 620                | 90.5 globlastp       |
| LNU885_H69                                                                                                                                                                                                                                                                                                    | cowpea 12v1 FF387653_P1                 | 1916              | 3908              | 620                | 90.5 globlastp       |
| LNU885_H70                                                                                                                                                                                                                                                                                                    | eschscholzia 11v1 CD476599_P1           | 1917              | 3909              | 620                | 90.5 globlastp       |
| LNU885_H71                                                                                                                                                                                                                                                                                                    | eschscholzia 11v1 CD478545_P1           | 1918              | 3910              | 620                | 90.5 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                        |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                   | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU885_H72                                                                                                                                                                                                                                                                                                    | pigeonpea 11v1 SRR054580X107320_P1     | 1919              | 3911              | 620                | 90.5          | globlastp |
| LNU885_H73                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.135185              | 1920              | 3912              | 620                | 90.5          | globlastp |
| LNU885_H74                                                                                                                                                                                                                                                                                                    | triphysaria 10v1 DR174094              | 1921              | 3913              | 620                | 90.5          | globlastp |
| LNU885_H165                                                                                                                                                                                                                                                                                                   | monkeyflower 12v1 DV209559_P1          | 1922              | 3914              | 620                | 90.3          | globlastp |
| LNU885_H75                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346935.112544_P1      | 1923              | 3915              | 620                | 90.3          | globlastp |
| LNU885_H76                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346935.130001_P1      | 1924              | 3916              | 620                | 90.3          | globlastp |
| LNU885_H77                                                                                                                                                                                                                                                                                                    | arnica 11v1 SRR099034X108499_P1        | 1925              | 3917              | 620                | 90.3          | globlastp |
| LNU885_H78                                                                                                                                                                                                                                                                                                    | banana 12v1 FF558852_P1                | 1926              | 3918              | 620                | 90.3          | globlastp |
| LNU885_H79                                                                                                                                                                                                                                                                                                    | blueberry 12v1 CV090498_P1             | 1927              | 3919              | 620                | 90.3          | globlastp |
| LNU885_H80                                                                                                                                                                                                                                                                                                    | monkeyflower 10v1 DV209559             | 1928              | 3914              | 620                | 90.3          | globlastp |
| LNU885_H81                                                                                                                                                                                                                                                                                                    | trigonella 11v1 SRR066194X112617       | 1929              | 3920              | 620                | 90.3          | globlastp |
| LNU885_H82                                                                                                                                                                                                                                                                                                    | triphysaria 10v1 BM357149              | 1930              | 3921              | 620                | 90.3          | globlastp |
| LNU885_H83                                                                                                                                                                                                                                                                                                    | arnica 11v1 SRR099034X107278_T1        | 1931              | 3922              | 620                | 90.28         | globlastn |
| LNU885_H84                                                                                                                                                                                                                                                                                                    | orobanche 10v1 SRR023189S0002711_T1    | 1932              | 3923              | 620                | 90.28         | globlastn |
| LNU885_H85                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346935.225484_P1      | 1933              | 3924              | 620                | 90.1          | globlastp |
| LNU885_H86                                                                                                                                                                                                                                                                                                    | euonymus 11v1 SRR070038X106031_P1      | 1934              | 3925              | 620                | 90.1          | globlastp |
| LNU885_H87                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 AI725994_P1   | 1935              | 3926              | 620                | 90.1          | globlastp |
| LNU885_H88                                                                                                                                                                                                                                                                                                    | medicago 12v1 AW256519_P1              | 1936              | 3927              | 620                | 90.1          | globlastp |
| LNU885_H89                                                                                                                                                                                                                                                                                                    | spruce 11v1 EF678303                   | 1937              | 3928              | 620                | 90.1          | globlastp |
| LNU885_H90                                                                                                                                                                                                                                                                                                    | spruce 11v1 ES226997                   | 1938              | 3929              | 620                | 90.1          | globlastp |
| LNU885_H91                                                                                                                                                                                                                                                                                                    | spruce 11v1 EX358693                   | 1939              | 3930              | 620                | 90.1          | globlastp |
| LNU885_H166                                                                                                                                                                                                                                                                                                   | bean 12v2 CA898352_P1                  | 1940              | 3931              | 620                | 89.9          | globlastp |
| LNU885_H92                                                                                                                                                                                                                                                                                                    | bean 12v1 CA898352                     | 1941              | 3931              | 620                | 89.9          | globlastp |
| LNU885_H93                                                                                                                                                                                                                                                                                                    | beech 11v1 SRR006293.13457_P1          | 1942              | 3932              | 620                | 89.9          | globlastp |
| LNU885_H94                                                                                                                                                                                                                                                                                                    | chelidonium 11v1 SRR084752X103249_P1   | 1943              | 3933              | 620                | 89.9          | globlastp |
| LNU885_H95                                                                                                                                                                                                                                                                                                    | cotton 11v1 AI725994_P1                | 1944              | 3934              | 620                | 89.9          | globlastp |
| LNU885_H96                                                                                                                                                                                                                                                                                                    | lettuce 12v1 DW066578_P1               | 1945              | 3935              | 620                | 89.9          | globlastp |
| LNU885_H97                                                                                                                                                                                                                                                                                                    | poppy 11v1 SRR030259.334416_P1         | 1946              | 3936              | 620                | 89.9          | globlastp |
| LNU885_H98                                                                                                                                                                                                                                                                                                    | tripterygium 11v1 SRR098677X103558     | 1947              | 3937              | 620                | 89.9          | globlastp |
| LNU885_H167                                                                                                                                                                                                                                                                                                   | chickpea 13v2 ES560343_P1              | 1948              | 3938              | 620                | 89.7          | globlastp |
| LNU885_H99                                                                                                                                                                                                                                                                                                    | abies 11v2 SRR098676X100633_P1         | 1949              | 3939              | 620                | 89.7          | globlastp |
| LNU885_H100                                                                                                                                                                                                                                                                                                   | grape 11v1 GSV1VT01000590001_P1        | 1950              | 3940              | 620                | 89.7          | globlastp |
| LNU885_H101                                                                                                                                                                                                                                                                                                   | pine 10v2 AW011601_P1                  | 1951              | 3941              | 620                | 89.7          | globlastp |
| LNU885_H102                                                                                                                                                                                                                                                                                                   | pseudotsuga 10v1 SRR065119S0006094     | 1952              | 3942              | 620                | 89.7          | globlastp |
| LNU885_H103                                                                                                                                                                                                                                                                                                   | safflower gb162 EL375744               | 1953              | 3943              | 620                | 89.7          | globlastp |
| LNU885_H104                                                                                                                                                                                                                                                                                                   | sunflower 12v1 CD851729                | 1954              | 3944              | 620                | 89.7          | globlastp |
| LNU885_H105                                                                                                                                                                                                                                                                                                   | vinca 11v1 SRR098690X103497            | 1955              | 3945              | 620                | 89.7          | globlastp |
| LNU885_H106                                                                                                                                                                                                                                                                                                   | solanum_phureja 09v1 SPHBE920118       | 1956              | 3946              | 620                | 89.6          | globlastp |
| LNU885_H107                                                                                                                                                                                                                                                                                                   | maritime_pine 10v1 BX251751_P1         | 1957              | 3947              | 620                | 89.5          | globlastp |
| LNU885_H108                                                                                                                                                                                                                                                                                                   | poppy 11v1 FE964991_P1                 | 1958              | 3948              | 620                | 89.5          | globlastp |
| LNU885_H109                                                                                                                                                                                                                                                                                                   | radish gb164 EV546967                  | 1959              | 3949              | 620                | 89.5          | globlastp |
| LNU885_H110                                                                                                                                                                                                                                                                                                   | valeriana 11v1 SRR099039X104384        | 1960              | 3950              | 620                | 89.5          | globlastp |
| LNU885_H111                                                                                                                                                                                                                                                                                                   | cirsium 11v1 SRR346952.209008_P1       | 1961              | 3951              | 620                | 89.4          | globlastp |
| LNU885_H112                                                                                                                                                                                                                                                                                                   | b_rapa 11v1 CD827580_P1                | 1962              | 3952              | 620                | 89.3          | globlastp |
| LNU885_H113                                                                                                                                                                                                                                                                                                   | canola 11v1 CN735656_P1                | 1963              | 3953              | 620                | 89.3          | globlastp |
| LNU885_H114                                                                                                                                                                                                                                                                                                   | canola 11v1 DY011412_P1                | 1964              | 3954              | 620                | 89.3          | globlastp |
| LNU885_H115                                                                                                                                                                                                                                                                                                   | canola 11v1 EE444048_P1                | 1965              | 3955              | 620                | 89.3          | globlastp |
| LNU885_H116                                                                                                                                                                                                                                                                                                   | poplar 10v1 AI162097                   | 1966              | 3956              | 620                | 89.3          | globlastp |
| LNU885_H116                                                                                                                                                                                                                                                                                                   | poplar 13v1 AI162097_P1                | 1967              | 3956              | 620                | 89.3          | globlastp |
| LNU885_H117                                                                                                                                                                                                                                                                                                   | thellungiella_halophilum 11v1 DN774318 | 1968              | 3957              | 620                | 89.3          | globlastp |
| LNU885_H118                                                                                                                                                                                                                                                                                                   | vinca 11v1 SRR098690X104249            | 1969              | 3958              | 620                | 89.3          | globlastp |
| LNU885_H119                                                                                                                                                                                                                                                                                                   | b_juncea 12v1 E6ANDIZ01AULG5_P1        | 1970              | 3959              | 620                | 89.2          | globlastp |
| LNU885_H120                                                                                                                                                                                                                                                                                                   | b_rapa 11v1 CD815423_P1                | 1971              | 3960              | 620                | 89.2          | globlastp |
| LNU885_H121                                                                                                                                                                                                                                                                                                   | canola 11v1 DY006806_P1                | 1972              | 3961              | 620                | 89.2          | globlastp |
| LNU885_H122                                                                                                                                                                                                                                                                                                   | radish gb164 EW731499                  | 1973              | 3962              | 620                | 89.2          | globlastp |
| LNU885_H123                                                                                                                                                                                                                                                                                                   | tabernaemontana 11v1 SRR098689X100123  | 1974              | 3963              | 620                | 89.2          | globlastp |
| LNU885_H124                                                                                                                                                                                                                                                                                                   | tripterygium 11v1 SRR098677X106478     | 1975              | 3964              | 620                | 89.2          | globlastp |
| LNU885_H125                                                                                                                                                                                                                                                                                                   | ambrosia 11v1 SRR346935.160786_T1      | 1976              | 3965              | 620                | 89.16         | globlastn |
| LNU885_H126                                                                                                                                                                                                                                                                                                   | arabidopsis_lyrata 09v1 JGLAL002814_P1 | 1977              | 3966              | 620                | 89            | globlastp |
| LNU885_H127                                                                                                                                                                                                                                                                                                   | b_rapa 11v1 CX188616_P1                | 1978              | 3967              | 620                | 89            | globlastp |
| LNU885_H128                                                                                                                                                                                                                                                                                                   | canola 11v1 EE459861_T1                | 1979              | 3968              | 620                | 88.97         | globlastn |
| LNU885_H129                                                                                                                                                                                                                                                                                                   | centaurea gb166 EL934279_T1            | 1980              | 3969              | 620                | 88.97         | globlastn |
| LNU885_H130                                                                                                                                                                                                                                                                                                   | zostera 10v1 AM769778                  | 1981              | 3970              | 620                | 88.97         | globlastn |
| LNU885_H131                                                                                                                                                                                                                                                                                                   | arabidopsis 10v1 AT1G24510_P1          | 1982              | 3971              | 620                | 88.8          | globlastp |
| LNU885_H132                                                                                                                                                                                                                                                                                                   | poplar 10v1 BU831685                   | 1983              | 3972              | 620                | 88.8          | globlastp |
| LNU885_H132                                                                                                                                                                                                                                                                                                   | poplar 13v1 BU824523_P1                | 1984              | 3972              | 620                | 88.8          | globlastp |
| LNU885_H133                                                                                                                                                                                                                                                                                                   | sequoia 10v1 SRR065044S0007458         | 1985              | 3973              | 620                | 88.8          | globlastp |
| LNU885_H134                                                                                                                                                                                                                                                                                                   | thellungiella_parvulum 11v1 DN774318   | 1986              | 3974              | 620                | 88.8          | globlastp |
| LNU885_H135                                                                                                                                                                                                                                                                                                   | cephalotaxus 11v1 SRR064395X110135_P1  | 1987              | 3975              | 620                | 88.6          | globlastp |
| LNU885_H136                                                                                                                                                                                                                                                                                                   | aquilegia 10v2 DR928892_P1             | 1988              | 3976              | 620                | 88.2          | globlastp |
| LNU885_H137                                                                                                                                                                                                                                                                                                   | podocarpus 10v1 SRR065014S0010290_P1   | 1989              | 3977              | 620                | 88.2          | globlastp |
| LNU885_H138                                                                                                                                                                                                                                                                                                   | sciadopitys 10v1 SRR065035S0017103     | 1990              | 3978              | 620                | 88.2          | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                       |                   |                   |                    |               |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------|-------------------|--------------------|---------------|------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                  | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.     |
| LNU885_H139                                                                                                                                                                                                                                                                                                   | barley 12v1 BQ762736_T1               | 1991              | 3979              | 620                | 88.1          | glotblastn |
| LNU885_H140                                                                                                                                                                                                                                                                                                   | pteridium 11v1 SRR043594X100385       | 1992              | 3980              | 620                | 88.04         | glotblastn |
| LNU885_H141                                                                                                                                                                                                                                                                                                   | beet 12v1 B1543248_P1                 | 1993              | 3981              | 620                | 88            | globlastp  |
| LNU885_H142                                                                                                                                                                                                                                                                                                   | gnetum 10v1 DN954800_T1               | 1994              | 3982              | 620                | 87.85         | glotblastn |
| LNU885_H143                                                                                                                                                                                                                                                                                                   | nasturtium 11v1 SRR032558.163106_P1   | 1995              | 3983              | 620                | 87.3          | glotblastp |
| LNU885_H144                                                                                                                                                                                                                                                                                                   | physcomitrella 10v1 AW145268_P1       | 1996              | 3984              | 620                | 87.3          | globlastp  |
| LNU885_H145                                                                                                                                                                                                                                                                                                   | onion 12v1 SRR073446X113522D1_P1      | 1997              | 3985              | 620                | 86.9          | globlastp  |
| LNU885_H168                                                                                                                                                                                                                                                                                                   | zostera 12v1 SRR057351X10529D1_P1     | 1998              | 3986              | 620                | 86.7          | globlastp  |
| LNU885_H146                                                                                                                                                                                                                                                                                                   | zostera 10v1 SRR057351S0000962        | 1999              | 3986              | 620                | 86.7          | globlastp  |
| LNU885_H147                                                                                                                                                                                                                                                                                                   | spikemoss gb165 FE443744              | 2000              | 3987              | 620                | 86.6          | globlastp  |
| LNU885_H148                                                                                                                                                                                                                                                                                                   | silene 11v1 SRR096785X166572          | 2001              | 3988              | 620                | 86.5          | globlastp  |
| LNU885_H149                                                                                                                                                                                                                                                                                                   | ceratodon 10v1 SRR074890S0022653_P1   | 2002              | 3989              | 620                | 86            | globlastp  |
| LNU885_H150                                                                                                                                                                                                                                                                                                   | vinca 11v1 SRR098690X104840           | 2003              | 3990              | 620                | 85.6          | globlastp  |
| LNU885_H151                                                                                                                                                                                                                                                                                                   | distylium 11v1 SRR065077X10363_T1     | 2004              | 3991              | 620                | 85.42         | glotblastn |
| LNU885_H169                                                                                                                                                                                                                                                                                                   | olea 13v1 SRR014463X11934D1_T1        | 2005              | 3992              | 620                | 85.23         | glotblastn |
| LNU885_H152                                                                                                                                                                                                                                                                                                   | flaveria 11v1 SRR149229.10823_P1      | 2006              | 3993              | 620                | 84.7          | globlastp  |
| LNU885_H153                                                                                                                                                                                                                                                                                                   | taxus 10v1 SRR032523S0062074          | 2007              | 3994              | 620                | 84.1          | globlastp  |
| LNU885_H154                                                                                                                                                                                                                                                                                                   | switchgrass gb167 DN151949            | 2008              | 3995              | 620                | 83.9          | globlastp  |
| LNU885_H155                                                                                                                                                                                                                                                                                                   | spikemoss gb165 FE436590              | 2009              | 3996              | 620                | 83.6          | globlastp  |
| LNU885_H170                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana 12v1 BP752014_P1  | 2010              | 3997              | 620                | 82.1          | globlastp  |
| LNU887_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BG319820_P1                | 2011              | 3998              | 622                | 90.6          | globlastp  |
| LNU887_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612301_P1       | 2012              | 3999              | 622                | 84.6          | globlastp  |
| LNU887_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL748385_P1          | 2013              | 4000              | 622                | 82.5          | globlastp  |
| LNU887_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL748385            | 2014              | 4001              | 622                | 81.4          | glotblastn |
| LNU887_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 GD046086_P1          | 2015              | 4002              | 622                | 80.7          | globlastp  |
| LNU888_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 CD491419                   | 2016              | 623               | 623                | 100           | globlastp  |
| LNU888_H2                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA111963               | 2017              | 4003              | 623                | 92.3          | globlastp  |
| LNU888_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187765.216058_P1  | 2018              | 4004              | 623                | 91.3          | globlastp  |
| LNU888_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613111_P1       | 2019              | 4005              | 623                | 91.3          | globlastp  |
| LNU888_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI032010M_P1  | 2020              | 4006              | 623                | 91.3          | globlastp  |
| LNU888_H5                                                                                                                                                                                                                                                                                                     | maize 10v1 BM379136_P1                | 2021              | 4007              | 623                | 91.3          | globlastp  |
| LNU888_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187769.1154845_P1 | 2022              | 4008              | 623                | 89.4          | globlastp  |
| LNU888_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 DN149585_T1          | 2023              | 4009              | 623                | 84.62         | glotblastn |
| LNU889_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AI966901_P1                | 2024              | 4010              | 624                | 87.1          | globlastp  |
| LNU889_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187768.382752_P1  | 2025              | 4011              | 624                | 82            | globlastp  |
| LNU889_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187766.665224_P1  | 2026              | 4012              | 624                | 80.9          | globlastp  |
| LNU889_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE616994            | 2027              | 4013              | 624                | 80.9          | globlastp  |
| LNU892_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB02G033220              | 2028              | 4014              | 626                | 95.7          | globlastp  |
| LNU892_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI619171_P1                | 2029              | 4015              | 626                | 92.7          | globlastp  |
| LNU892_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB02G033200              | 2030              | 4016              | 626                | 90.4          | globlastp  |
| LNU892_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI029552M_P1  | 2031              | 4017              | 626                | 86.5          | globlastp  |
| LNU892_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187765.29978_P1   | 2032              | 4018              | 626                | 86.1          | globlastp  |
| LNU892_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 GD022360_P1          | 2033              | 4019              | 626                | 85.5          | globlastp  |
| LNU892_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI029584M_P1  | 2034              | 4020              | 626                | 85.3          | globlastp  |
| LNU892_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI029578M_P1  | 2035              | 4021              | 626                | 81.8          | globlastp  |
| LNU893_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL793626_P1          | 2036              | 4022              | 627                | 98.6          | globlastp  |
| LNU893_H14                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187771.339181_P1  | 2037              | 4022              | 627                | 98.6          | globlastp  |
| LNU893_H1                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL793626            | 2038              | 4022              | 627                | 98.6          | globlastp  |
| LNU893_H2                                                                                                                                                                                                                                                                                                     | barley 12v1 AW982181_P1               | 2039              | 4023              | 627                | 97.3          | globlastp  |
| LNU893_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI031280M_P1  | 2040              | 4024              | 627                | 97.3          | globlastp  |
| LNU893_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 BG517269_P1                | 2041              | 4025              | 627                | 97.3          | globlastp  |
| LNU893_H5                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM670348_P1         | 2042              | 4024              | 627                | 97.3          | globlastp  |
| LNU893_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 BE495982                     | 2043              | 4023              | 627                | 97.3          | globlastp  |
| LNU893_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA728398                   | 2044              | 4023              | 627                | 97.3          | globlastp  |
| LNU893_H8                                                                                                                                                                                                                                                                                                     | fescue gb161 DT686545_P1              | 2045              | 4026              | 627                | 95.9          | globlastp  |
| LNU893_H9                                                                                                                                                                                                                                                                                                     | lolum 10v1 AU246324_P1                | 2046              | 4026              | 627                | 95.9          | globlastp  |
| LNU893_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 CF330515                    | 2047              | 4027              | 627                | 94.7          | globlastp  |
| LNU893_H11                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI1G24640_P1     | 2048              | 4028              | 627                | 90.7          | globlastp  |
| LNU893_H12                                                                                                                                                                                                                                                                                                    | oil_palm 11v1 SRR190701.565537_P1     | 2049              | 4029              | 627                | 82.4          | globlastp  |
| LNU894_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB02G039433              | 2050              | 4030              | 628                | 93.5          | globlastp  |
| LNU894_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA502683                   | 2051              | 4030              | 628                | 93.5          | globlastp  |
| LNU894_H3                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA147729               | 2052              | 4031              | 628                | 86.9          | globlastp  |
| LNU895_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW244938_P1                | 2053              | 4032              | 629                | 91.2          | globlastp  |
| LNU895_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE641349            | 2054              | 4033              | 629                | 85.3          | globlastp  |
| LNU895_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE641349_P1          | 2055              | 4034              | 629                | 84.3          | globlastp  |
| LNU895_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI031608M_P1  | 2056              | 4035              | 629                | 82.4          | globlastp  |
| LNU896_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW497539_P1                | 2057              | 4036              | 630                | 81.1          | globlastp  |
| LNU899_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW288640_P1                | 2058              | 4037              | 633                | 91.6          | globlastp  |
| LNU899_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI000435M_P1  | 2059              | 4038              | 633                | 87.3          | globlastp  |
| LNU899_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL704161            | 2060              | 4039              | 633                | 86.64         | glotblastn |
| LNU899_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL748364_P1          | 2061              | 4040              | 633                | 84.4          | globlastp  |
| LNU899_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL704161_P1          | 2062              | 4041              | 633                | 80.8          | globlastp  |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU900_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW052900_P1               | 2063              | 4042              | 634                | 93.6          | globlastp |
| LNU900_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI002469M_P1 | 2064              | 4043              | 634                | 90.3          | globlastp |
| LNU900_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL696960_P1         | 2065              | 4044              | 634                | 89.5          | globlastp |
| LNU900_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.183573            | 2066              | 4045              | 634                | 88.24         | globlastn |
| LNU900_H4                                                                                                                                                                                                                                                                                                     | barley 12v1 AJ466045_P1              | 2067              | 4046              | 634                | 87.5          | globlastp |
| LNU900_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA743258                  | 2068              | 4047              | 634                | 87.5          | globlastp |
| LNU900_H6                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G06440_P1    | 2069              | 4048              | 634                | 86.7          | globlastp |
| LNU901_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ964628_P1               | 2070              | 4049              | 635                | 90.1          | globlastp |
| LNU901_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE638167_T1         | 2071              | 4050              | 635                | 83.6          | globlastn |
| LNU902_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ622490_P1               | 2072              | 4051              | 636                | 93.4          | globlastp |
| LNU902_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI002453M_P1 | 2073              | 4052              | 636                | 88.6          | globlastp |
| LNU902_H3                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM024444_T1        | 2074              | 4053              | 636                | 86.16         | globlastn |
| LNU902_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN140927           | 2075              | 4054              | 636                | 84.08         | globlastn |
| LNU902_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 GD033452_T1         | 2076              | 4055              | 636                | 83.74         | globlastn |
| LNU903_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ979716_P1               | 2077              | 4056              | 637                | 92.3          | globlastp |
| LNU903_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AW216295_P1               | 2078              | 4057              | 637                | 91.1          | globlastp |
| LNU903_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612307_P1      | 2079              | 4058              | 637                | 89.9          | globlastp |
| LNU903_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL699073_P1         | 2080              | 4059              | 637                | 88.1          | globlastp |
| LNU903_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN150122           | 2081              | 4060              | 637                | 87.9          | globlastp |
| LNU904_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ947568_P1               | 2082              | 4061              | 638                | 83.1          | globlastp |
| LNU905_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW052874_P1               | 2083              | 4062              | 639                | 88.4          | globlastp |
| LNU908_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 HO266689_P1         | 2084              | 4063              | 642                | 88.7          | globlastp |
| LNU908_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI005411M_P1 | 2085              | 4064              | 642                | 88.6          | globlastp |
| LNU908_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL973257_P1         | 2086              | 4065              | 642                | 88.1          | globlastp |
| LNU908_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187765.276211_P1 | 2087              | 4065              | 642                | 88.1          | globlastp |
| LNU908_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 DT641006_P1               | 2088              | 4066              | 642                | 87.4          | globlastp |
| LNU908_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 CK056423                   | 2089              | 4067              | 642                | 83.5          | globlastp |
| LNU908_H4                                                                                                                                                                                                                                                                                                     | rice 11v1 HS372695                   | 2090              | 4068              | 642                | 83.46         | globlastn |
| LNU908_H8                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR400820X635658D1_T1     | 2091              | 4069              | 642                | 80.12         | globlastn |
| LNU908_H9                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G46140_P1    | 2092              | 4070              | 642                | 80.1          | globlastp |
| LNU909_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BQ577951_P1               | 2093              | 4071              | 643                | 92.1          | globlastp |
| LNU910_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BG837207_P1               | 2094              | 4072              | 644                | 90.1          | globlastp |
| LNU910_H2                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA242307              | 2095              | 4073              | 644                | 89.8          | globlastp |
| LNU910_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL945810_P1         | 2096              | 4074              | 644                | 88.9          | globlastp |
| LNU910_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI003477M_P1 | 2097              | 4075              | 644                | 88.9          | globlastp |
| LNU910_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL927878           | 2098              | 4076              | 644                | 87.88         | globlastn |
| LNU910_H5                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM187011_P1        | 2099              | 4077              | 644                | 84.8          | globlastp |
| LNU910_H9                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G50130_P1    | 2100              | 4078              | 644                | 83            | globlastp |
| LNU910_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 BI795617                   | 2101              | 4079              | 644                | 82            | globlastn |
| LNU910_H6                                                                                                                                                                                                                                                                                                     | maize 10v1 CD946808_T1               | 2102              | 4080              | 644                | 81.63         | globlastn |
| LNU910_H10                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI2G50136_P1    | 2103              | 4081              | 644                | 80            | globlastp |
| LNU912_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL792538_P1         | 2104              | 4082              | 646                | 91            | globlastp |
| LNU912_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI001740M_P1 | 2105              | 4083              | 646                | 91            | globlastp |
| LNU912_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL751233_P1         | 2106              | 4084              | 646                | 90.5          | globlastp |
| LNU912_H2                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM056333_P1        | 2107              | 4085              | 646                | 89.8          | globlastp |
| LNU912_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ948274_P1               | 2108              | 4086              | 646                | 87.7          | globlastp |
| LNU912_H4                                                                                                                                                                                                                                                                                                     | rice 11v1 BM420858                   | 2109              | 4087              | 646                | 84.6          | globlastp |
| LNU912_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G52680_P1    | 2110              | 4088              | 646                | 83.1          | globlastp |
| LNU912_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 BU099391                  | 2111              | 4089              | 646                | 80.9          | globlastp |
| LNU912_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BM136936                  | 2112              | 4090              | 646                | 80.4          | globlastp |
| LNU912_H8                                                                                                                                                                                                                                                                                                     | barley 12v1 AK371517_P1              | 2113              | 4091              | 646                | 80.3          | globlastp |
| LNU913_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA082310              | 2114              | 4092              | 647                | 97.9          | globlastp |
| LNU913_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 W59840_P1                 | 2115              | 4093              | 647                | 96.7          | globlastp |
| LNU913_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612650_P1      | 2116              | 4094              | 647                | 93.8          | globlastp |
| LNU913_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE617311_P1         | 2117              | 4095              | 647                | 92.5          | globlastp |
| LNU913_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE616665_P1         | 2118              | 4096              | 647                | 91.5          | globlastp |
| LNU913_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM018338_P1        | 2119              | 4097              | 647                | 86.1          | globlastp |
| LNU913_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE616665           | 2120              | 4098              | 647                | 85.33         | globlastn |
| LNU913_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 BI808261                   | 2121              | 4099              | 647                | 83.3          | globlastp |
| LNU913_H7                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G54580_P1    | 2122              | 4100              | 647                | 82.4          | globlastp |
| LNU913_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.116346            | 2123              | 4101              | 647                | 82.2          | globlastp |
| LNU913_H9                                                                                                                                                                                                                                                                                                     | wheat 12v3 BU100850                  | 2124              | 4102              | 647                | 81.7          | globlastp |
| LNU913_H10                                                                                                                                                                                                                                                                                                    | barley 12v1 AV834883_P1              | 2125              | 4103              | 647                | 81.6          | globlastp |
| LNU914_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB04G000570             | 2126              | 4104              | 648                | 94.5          | globlastp |
| LNU914_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ665003_P1               | 2127              | 4105              | 648                | 85.6          | globlastp |
| LNU914_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ372104_P1               | 2128              | 4106              | 648                | 84.4          | globlastp |
| LNU915_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI016626M_P1 | 2129              | 4107              | 649                | 88.4          | globlastp |
| LNU915_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL695083_P1         | 2130              | 4108              | 649                | 87.8          | globlastp |
| LNU915_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BE453841_P1               | 2131              | 4109              | 649                | 86.3          | globlastp |
| LNU916_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 AW284247                | 2132              | 4110              | 650                | 81.8          | globlastp |
| LNU917_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 BQ534456              | 2133              | 4111              | 651                | 96.8          | globlastp |
| LNU917_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI017544M_P1 | 2134              | 4112              | 651                | 91.2          | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                       |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                  | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU917_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 AI673988_P1                | 2135              | 4113              | 651                | 90.4          | globlastp |
| LNU917_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN142589            | 2136              | 4114              | 651                | 90.2          | globlastp |
| LNU917_H5                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM028850_P1         | 2137              | 4115              | 651                | 89.6          | globlastp |
| LNU917_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL813544_P1          | 2138              | 4116              | 651                | 88.1          | globlastp |
| LNU917_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE400183                   | 2139              | 4117              | 651                | 85.1          | globlastp |
| LNU917_H7                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.113593             | 2140              | 4118              | 651                | 84.3          | globlastp |
| LNU917_H8                                                                                                                                                                                                                                                                                                     | leymus gb166 EG375025_P1              | 2141              | 4119              | 651                | 84            | globlastp |
| LNU917_H9                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G06290_P1     | 2142              | 4120              | 651                | 83.8          | globlastp |
| LNU917_H10                                                                                                                                                                                                                                                                                                    | fescue gb161 DT701360_P1              | 2143              | 4121              | 651                | 82.4          | globlastp |
| LNU917_H11                                                                                                                                                                                                                                                                                                    | maize 10v1 BQ048402_P1                | 2144              | 4122              | 651                | 82.3          | globlastp |
| LNU918_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ006536_P1                | 2145              | 4123              | 652                | 85.6          | globlastp |
| LNU918_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 EY960159_T1                | 2146              | 4124              | 652                | 83.73         | globlastp |
| LNU918_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN149185            | 2147              | 4125              | 652                | 81.15         | globlastp |
| LNU918_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 DN149185_P1          | 2148              | 4126              | 652                | 80.6          | globlastp |
| LNU920_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CF576045               | 2149              | 4127              | 654                | 89.2          | globlastp |
| LNU920_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI677118_P1                | 2150              | 4128              | 654                | 84.2          | globlastp |
| LNU920_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE646248_P1          | 2151              | 4129              | 654                | 81.5          | globlastp |
| LNU920_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI018467M_P1  | 2152              | 4130              | 654                | 80.9          | globlastp |
| LNU920_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE646248            | 2153              | 4131              | 654                | 80.9          | globlastp |
| LNU921_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 CA400159_P1                | 2154              | 4132              | 655                | 82            | globlastp |
| LNU922_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN143068_P1          | 2155              | 4133              | 656                | 96.2          | globlastp |
| LNU922_H1                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE620798            | 2156              | 4134              | 656                | 96.2          | globlastp |
| LNU922_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI017460M_P1  | 2157              | 4135              | 656                | 95.7          | globlastp |
| LNU922_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 AJ901428_P1                | 2158              | 4136              | 656                | 95.7          | globlastp |
| LNU922_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN143068            | 2159              | 4137              | 656                | 95.7          | globlastp |
| LNU922_H5                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM010006_P1         | 2160              | 4138              | 656                | 94.9          | globlastp |
| LNU922_H6                                                                                                                                                                                                                                                                                                     | maize 10v1 AA011883_P1                | 2161              | 4139              | 656                | 94.6          | globlastp |
| LNU922_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 BI805551                    | 2162              | 4140              | 656                | 92.1          | globlastp |
| LNU922_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G52340T2_P1   | 2163              | 4141              | 656                | 87            | globlastp |
| LNU922_H9                                                                                                                                                                                                                                                                                                     | oat 11v1 CN817149_P1                  | 2164              | 4142              | 656                | 86.5          | globlastp |
| LNU922_H10                                                                                                                                                                                                                                                                                                    | wheat 12v3 BQ802727                   | 2165              | 4143              | 656                | 86.5          | globlastp |
| LNU922_H11                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI5G01350_P1     | 2166              | 4144              | 656                | 86.2          | globlastp |
| LNU922_H12                                                                                                                                                                                                                                                                                                    | barley 12v1 BE412861_P1               | 2167              | 4145              | 656                | 86            | globlastp |
| LNU922_H13                                                                                                                                                                                                                                                                                                    | cenchrus gb166 EB660552_P1            | 2168              | 4146              | 656                | 86            | globlastp |
| LNU922_H14                                                                                                                                                                                                                                                                                                    | rye 12v1 BE586503                     | 2169              | 4147              | 656                | 85.5          | globlastp |
| LNU922_H15                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.249546             | 2170              | 4148              | 656                | 80.7          | globlastp |
| LNU923_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BI273413_P1                | 2171              | 4149              | 657                | 81.5          | globlastp |
| LNU924_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA070317               | 2172              | 4150              | 658                | 83.8          | globlastp |
| LNU924_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL935940_P1          | 2173              | 4151              | 658                | 80.9          | globlastp |
| LNU924_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 DN145033_P1          | 2174              | 4152              | 658                | 80.4          | globlastp |
| LNU924_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 SOLX00022667_P1   | 2175              | 4153              | 658                | 80.4          | globlastp |
| LNU925_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 FL010481_P1                | 2176              | 4154              | 659                | 94.2          | globlastp |
| LNU925_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI016794M_P1  | 2177              | 4155              | 659                | 89.5          | globlastp |
| LNU925_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187770.1008801_P1 | 2178              | 4156              | 659                | 86            | globlastp |
| LNU925_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187769.231821_P1  | 2179              | 4157              | 659                | 85.7          | globlastp |
| LNU925_H3                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G51590_P1     | 2180              | 4158              | 659                | 85.4          | globlastp |
| LNU925_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 TA12V11729457              | 2181              | 4159              | 659                | 85.31         | globlastp |
| LNU925_H5                                                                                                                                                                                                                                                                                                     | barley 12v1 HV12v1CRP055339_P1        | 2182              | 4160              | 659                | 85            | globlastp |
| LNU925_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 CX104415                    | 2183              | 4161              | 659                | 81.1          | globlastp |
| LNU925_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA731766                   | 2184              | 4162              | 659                | 80.2          | globlastp |
| LNU925_H8                                                                                                                                                                                                                                                                                                     | barley 12v1 BI777343_P1               | 2185              | 4163              | 659                | 80.1          | globlastp |
| LNU926_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA088361               | 2186              | 4164              | 660                | 96.4          | globlastp |
| LNU926_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI017439M_P1  | 2187              | 4165              | 660                | 94.3          | globlastp |
| LNU926_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 BI389475_P1                | 2188              | 4166              | 660                | 93.7          | globlastp |
| LNU926_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 BM078145_P1                | 2189              | 4167              | 660                | 93.7          | globlastp |
| LNU926_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL896622_P1          | 2190              | 4168              | 660                | 91.9          | globlastp |
| LNU926_H5                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM001369_P1         | 2191              | 4169              | 660                | 91.9          | globlastp |
| LNU926_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL736268            | 2192              | 4170              | 660                | 91.3          | globlastp |
| LNU926_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL736268_P1          | 2193              | 4171              | 660                | 91            | globlastp |
| LNU928_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AI666263_P1                | 2194              | 4172              | 661                | 96.9          | globlastp |
| LNU928_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL703064_P1          | 2195              | 4173              | 661                | 90.2          | globlastp |
| LNU928_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL827336_P1          | 2196              | 4174              | 661                | 89.9          | globlastp |
| LNU928_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI016502M_P1  | 2197              | 4175              | 661                | 89.6          | globlastp |
| LNU928_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 BI812770                    | 2198              | 4176              | 661                | 80.26         | globlastp |
| LNU928_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.253036             | 2199              | 4177              | 661                | 80.14         | globlastp |
| LNU929_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB04G036770              | 2200              | 4178              | 662                | 85.4          | globlastp |
| LNU929_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BG836023_P1                | 2201              | 4179              | 662                | 83.4          | globlastp |
| LNU929_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI017734M_P1  | 2202              | 4180              | 662                | 83.1          | globlastp |
| LNU929_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL792661_P1          | 2203              | 4181              | 662                | 82.8          | globlastp |
| LNU929_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187772.1076529_P1 | 2204              | 4182              | 662                | 82.2          | globlastp |
| LNU929_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM007685_T1         | 2205              | 4183              | 662                | 80.76         | globlastp |
| LNU931_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA085385               | 2206              | 4184              | 664                | 95.3          | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU931_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI026372M_P1 | 2207              | 4185              | 664                | 91.7 globlastp       |
| LNU931_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 AW052904_P1               | 2208              | 4186              | 664                | 90.9 globlastp       |
| LNU931_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI010145M_P1 | 2209              | 4187              | 664                | 89.7 globlastp       |
| LNU931_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL690712           | 2210              | 4188              | 664                | 89.51 globlastn      |
| LNU931_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL690712_P1         | 2211              | 4189              | 664                | 88.8 globlastp       |
| LNU931_H6                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB05G000560             | 2212              | 4190              | 664                | 88.8 globlastp       |
| LNU931_H7                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA183007              | 2213              | 4191              | 664                | 87.5 globlastp       |
| LNU931_H8                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB08G000580             | 2214              | 4192              | 664                | 87.1 globlastp       |
| LNU931_H9                                                                                                                                                                                                                                                                                                     | millet 10v1 CD725261_P1              | 2215              | 4193              | 664                | 86.9 globlastp       |
| LNU931_H10                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI006320M_P1 | 2216              | 4194              | 664                | 82.6 globlastp       |
| LNU931_H11                                                                                                                                                                                                                                                                                                    | maize 10v1 AI795587_P1               | 2217              | 4195              | 664                | 82 globlastp         |
| LNU931_H14                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE652169_P1         | 2218              | 4196              | 664                | 81.2 globlastp       |
| LNU931_H12                                                                                                                                                                                                                                                                                                    | switchgrass gb167 FE652169           | 2219              | 4196              | 664                | 81.2 globlastp       |
| LNU934_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB05G0006960            | 2220              | 4197              | 667                | 97.7 globlastp       |
| LNU934_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 A920383_P1                | 2221              | 4198              | 667                | 91.1 globlastp       |
| LNU934_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 AI601020_P1               | 2222              | 4199              | 667                | 90.1 globlastp       |
| LNU934_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612232_P1      | 2223              | 4200              | 667                | 88.5 globlastp       |
| LNU934_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN146252           | 2224              | 4201              | 667                | 88.1 globlastp       |
| LNU934_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE626199           | 2225              | 4202              | 667                | 86.5 globlastp       |
| LNU934_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 BI801587                   | 2226              | 4203              | 667                | 83.2 globlastp       |
| LNU936_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW120427_P1               | 2227              | 4204              | 669                | 81.4 globlastp       |
| LNU940_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G000570             | 2228              | 4205              | 672                | 92.4 globlastp       |
| LNU940_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 GD019934_P1         | 2229              | 4206              | 672                | 89.1 globlastp       |
| LNU940_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BM080112_P1               | 2230              | 4207              | 672                | 89.1 globlastp       |
| LNU940_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL987004           | 2231              | 4206              | 672                | 89.1 globlastp       |
| LNU940_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI039636M_P1 | 2232              | 4208              | 672                | 88 globlastp         |
| LNU940_H5                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM050387_P1        | 2233              | 4209              | 672                | 88 globlastp         |
| LNU940_H17                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL987004_P1         | 2234              | 4210              | 672                | 87 globlastp         |
| LNU940_H18                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187766.558595_P1 | 2235              | 4211              | 672                | 87 globlastp         |
| LNU940_H6                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G35010_P1    | 2236              | 4212              | 672                | 87 globlastp         |
| LNU940_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 AU172742                   | 2237              | 4213              | 672                | 85.9 globlastp       |
| LNU940_H8                                                                                                                                                                                                                                                                                                     | cenchrus gb166 EB672242_P1           | 2238              | 4214              | 672                | 84.8 globlastp       |
| LNU940_H9                                                                                                                                                                                                                                                                                                     | barley 12v1 BG415270_P1              | 2239              | 4215              | 672                | 83.7 globlastp       |
| LNU940_H10                                                                                                                                                                                                                                                                                                    | pseudoroegneria gb167 FF361949       | 2240              | 4216              | 672                | 83.7 globlastp       |
| LNU940_H11                                                                                                                                                                                                                                                                                                    | fescue gb161 DT690522_P1             | 2241              | 4217              | 672                | 82.6 globlastp       |
| LNU940_H12                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.205554            | 2242              | 4218              | 672                | 82.6 globlastp       |
| LNU940_H13                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.443974            | 2243              | 4218              | 672                | 82.6 globlastp       |
| LNU940_H14                                                                                                                                                                                                                                                                                                    | wheat 12v3 BF474839                  | 2244              | 4218              | 672                | 82.6 globlastp       |
| LNU940_H15                                                                                                                                                                                                                                                                                                    | wheat 12v3 SRX035157S105600          | 2245              | 4219              | 672                | 80.4 globlastp       |
| LNU941_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 DV636549              | 2246              | 4220              | 673                | 82.8 globlastp       |
| LNU942_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN143194_P1         | 2247              | 4221              | 674                | 93 globlastp         |
| LNU942_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE600191_P1         | 2248              | 4222              | 674                | 93 globlastp         |
| LNU942_H1                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN143194           | 2249              | 4221              | 674                | 93 globlastp         |
| LNU942_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI948177_P1               | 2250              | 4223              | 674                | 92.7 globlastp       |
| LNU942_H3                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 BU103195              | 2251              | 4224              | 674                | 92.6 globlastp       |
| LNU942_H4                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB04G019760             | 2252              | 4225              | 674                | 92 globlastp         |
| LNU942_H5                                                                                                                                                                                                                                                                                                     | maize 10v1 DV523108_P1               | 2253              | 4226              | 674                | 90.6 globlastp       |
| LNU942_H17                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE600082_P1         | 2254              | 4227              | 674                | 88.6 globlastp       |
| LNU942_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE600082           | 2255              | 4228              | 674                | 88.3 globlastp       |
| LNU942_H7                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI010700M_P1 | 2256              | 4229              | 674                | 87.4 globlastp       |
| LNU942_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 PMSLX0006862D1_P1        | 2257              | 4230              | 674                | 87.3 globlastp       |
| LNU942_H9                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI020925M_P1 | 2258              | 4231              | 674                | 85.7 globlastp       |
| LNU942_H10                                                                                                                                                                                                                                                                                                    | leymus gb166 EG376656_P1             | 2259              | 4232              | 674                | 85.2 globlastp       |
| LNU942_H11                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE516147                  | 2260              | 4233              | 674                | 85.2 globlastp       |
| LNU942_H12                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.268452            | 2261              | 4234              | 674                | 84.23 globlastn      |
| LNU942_H13                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI5G13320_P1    | 2262              | 4235              | 674                | 84.2 globlastp       |
| LNU942_H14                                                                                                                                                                                                                                                                                                    | rice 11v1 BI798333                   | 2263              | 4236              | 674                | 83 globlastp         |
| LNU942_H18                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187765.620238_T1 | 2264              | 4237              | 674                | 81.76 globlastn      |
| LNU943_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW165435_P1               | 2265              | 4238              | 675                | 93.5 globlastp       |
| LNU943_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BU582245_P1               | 2266              | 4239              | 675                | 92.1 globlastp       |
| LNU943_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G018160             | 2267              | 4240              | 675                | 91.5 globlastp       |
| LNU943_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI022488M_P1 | 2268              | 4241              | 675                | 88.4 globlastp       |
| LNU943_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL700923           | 2269              | 4242              | 675                | 87.5 globlastp       |
| LNU943_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL946368_P1         | 2270              | 4243              | 675                | 86.7 globlastp       |
| LNU943_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI010535M_P1 | 2271              | 4244              | 675                | 86.4 globlastp       |
| LNU943_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 CA762359                   | 2272              | 4245              | 675                | 85 globlastp         |
| LNU943_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.256371            | 2273              | 4246              | 675                | 80.45 globlastn      |
| LNU944_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BE519358_P1               | 2274              | 4247              | 676                | 94.5 globlastp       |
| LNU944_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI013344M_P1 | 2275              | 4248              | 676                | 90.2 globlastp       |
| LNU944_H14                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE605775_P1         | 2276              | 4249              | 676                | 89.6 globlastp       |
| LNU944_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL691662           | 2277              | 4250              | 676                | 88.75 globlastn      |
| LNU944_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL693381_P1         | 2278              | 4251              | 676                | 87.4 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU944_H4                                                                                                                                                                                                                                                                                                     | rice 11v1 AU065195                   | 2279              | 4252              | 676                | 85.1 globlastp       |
| LNU944_H5                                                                                                                                                                                                                                                                                                     | rice 11v1 AA752897                   | 2280              | 4253              | 676                | 84.5 globlastp       |
| LNU944_H6                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI5G26450_P1    | 2281              | 4254              | 676                | 83.4 globlastp       |
| LNU944_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL693806_P1         | 2282              | 4255              | 676                | 82.9 globlastp       |
| LNU944_H7                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G12950_P1    | 2283              | 4256              | 676                | 82.5 globlastp       |
| LNU944_H8                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612109_P1      | 2284              | 4257              | 676                | 82.2 globlastp       |
| LNU944_H9                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB06G033190             | 2285              | 4258              | 676                | 82.1 globlastp       |
| LNU944_H10                                                                                                                                                                                                                                                                                                    | rye 12v1 BE588044                    | 2286              | 4259              | 676                | 81.9 globlastp       |
| LNU944_H11                                                                                                                                                                                                                                                                                                    | barley 12v1 BE231241_P1              | 2287              | 4260              | 676                | 81.7 globlastp       |
| LNU944_H12                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE416410                  | 2288              | 4261              | 676                | 81.5 globlastp       |
| LNU944_H13                                                                                                                                                                                                                                                                                                    | maize 10v1 AW119989_P1               | 2289              | 4262              | 676                | 81.2 globlastp       |
| LNU945_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA102004              | 2290              | 4263              | 677                | 95.7 globlastp       |
| LNU945_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 CF630693_P1               | 2291              | 4264              | 677                | 92.4 globlastp       |
| LNU945_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE610584_P1         | 2292              | 4265              | 677                | 90.2 globlastp       |
| LNU945_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL736798_P1         | 2293              | 4266              | 677                | 90.2 globlastp       |
| LNU945_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI014236M_P1 | 2294              | 4267              | 677                | 89.6 globlastp       |
| LNU945_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE610584           | 2295              | 4268              | 677                | 88.21 globlastp      |
| LNU945_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G16410_P1    | 2296              | 4269              | 677                | 86.1 globlastp       |
| LNU945_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE399236                  | 2297              | 4270              | 677                | 84.8 globlastp       |
| LNU945_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BF483870                  | 2298              | 4271              | 677                | 84.8 globlastp       |
| LNU945_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 BI796904                   | 2299              | 4272              | 677                | 84.3 globlastp       |
| LNU945_H9                                                                                                                                                                                                                                                                                                     | oat 11v1 GO589349_P1                 | 2300              | 4273              | 677                | 83.3 globlastp       |
| LNU945_H10                                                                                                                                                                                                                                                                                                    | barley 12v1 AV835214_P1              | 2301              | 4274              | 677                | 83 globlastp         |
| LNU945_H11                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.115501            | 2302              | 4275              | 677                | 81.5 globlastp       |
| LNU946_H3                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE622311_P1         | 2303              | 4276              | 678                | 88.1 globlastp       |
| LNU946_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI013314M_P1 | 2304              | 4277              | 678                | 86.8 globlastp       |
| LNU946_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE631618_P1         | 2305              | 4278              | 678                | 86.3 globlastp       |
| LNU946_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 CO517747_P1               | 2306              | 4279              | 678                | 85.3 globlastp       |
| LNU947_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW400079_T1               | 2307              | 4280              | 679                | 80.67 globlastp      |
| LNU948_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 CF244014_T1               | 2308              | 4281              | 680                | 85.13 globlastp      |
| LNU949_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA070316              | 2309              | 4282              | 681                | 91.6 globlastp       |
| LNU949_H2                                                                                                                                                                                                                                                                                                     | millet 10v1 CD725957_P1              | 2310              | 4283              | 681                | 80.3 globlastp       |
| LNU950_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA117340              | 2311              | 4284              | 682                | 93.5 globlastp       |
| LNU950_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB05G001050             | 2312              | 4285              | 682                | 88.5 globlastp       |
| LNU950_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI026369M_P1 | 2313              | 4286              | 682                | 86.5 globlastp       |
| LNU950_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC611923_P1      | 2314              | 4287              | 682                | 86.1 globlastp       |
| LNU950_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 DN142564           | 2315              | 4288              | 682                | 85.8 globlastp       |
| LNU950_H21                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE601370_P1         | 2316              | 4289              | 682                | 85.6 globlastp       |
| LNU950_H22                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN142564_P1         | 2317              | 4290              | 682                | 84.9 globlastp       |
| LNU950_H6                                                                                                                                                                                                                                                                                                     | maize 10v1 AI665950_P1               | 2318              | 4291              | 682                | 84.5 globlastp       |
| LNU950_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM003253_P1        | 2319              | 4292              | 682                | 84 globlastp         |
| LNU950_H8                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM002572_P1        | 2320              | 4293              | 682                | 82.7 globlastp       |
| LNU950_H9                                                                                                                                                                                                                                                                                                     | rice 11v1 BI808891                   | 2321              | 4294              | 682                | 82.7 globlastp       |
| LNU950_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 AF004947                   | 2322              | 4295              | 682                | 82 globlastp         |
| LNU950_H11                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE412095                  | 2323              | 4296              | 682                | 81.3 globlastp       |
| LNU950_H12                                                                                                                                                                                                                                                                                                    | wheat 12v3 CA664401                  | 2324              | 4297              | 682                | 81.3 globlastp       |
| LNU950_H13                                                                                                                                                                                                                                                                                                    | wheat 12v3 SRR043323X26334D1         | 2325              | 4297              | 682                | 81.3 globlastp       |
| LNU950_H14                                                                                                                                                                                                                                                                                                    | rice 11v1 AU174185                   | 2326              | 4298              | 682                | 81.1 globlastp       |
| LNU950_H15                                                                                                                                                                                                                                                                                                    | barley 12v1 AV910430_P1              | 2327              | 4299              | 682                | 80.9 globlastp       |
| LNU950_H16                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.134503            | 2328              | 4300              | 682                | 80.9 globlastp       |
| LNU950_H17                                                                                                                                                                                                                                                                                                    | maize 10v1 DR804998_P1               | 2329              | 4301              | 682                | 80.7 globlastp       |
| LNU950_H18                                                                                                                                                                                                                                                                                                    | maize 10v1 EG041994_P1               | 2330              | 4302              | 682                | 80.7 globlastp       |
| LNU950_H19                                                                                                                                                                                                                                                                                                    | wheat 12v3 CA719005                  | 2331              | 4303              | 682                | 80.7 globlastp       |
| LNU950_H20                                                                                                                                                                                                                                                                                                    | maize 10v1 CF064453_P1               | 2332              | 4304              | 682                | 80.3 globlastp       |
| LNU953_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI021031M_P1 | 2333              | 4305              | 685                | 98.5 globlastp       |
| LNU953_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI947816_P1               | 2334              | 4306              | 685                | 98 globlastp         |
| LNU953_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 BI810241                   | 2335              | 4307              | 685                | 94.8 globlastp       |
| LNU953_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G07167_P1    | 2336              | 4308              | 685                | 93.3 globlastp       |
| LNU953_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 BE587487                    | 2337              | 4309              | 685                | 92.8 globlastp       |
| LNU953_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 AA752560                   | 2338              | 4310              | 685                | 91.8 globlastp       |
| LNU953_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE606922                  | 2339              | 4311              | 685                | 89.93 globlastp      |
| LNU953_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G15710_P1    | 2340              | 4312              | 685                | 89.8 globlastp       |
| LNU953_H9                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB05G022390             | 2341              | 4313              | 685                | 88.9 globlastp       |
| LNU953_H10                                                                                                                                                                                                                                                                                                    | oil_palm 11v1 EY408711XX1_T1         | 2342              | 4314              | 685                | 88.62 globlastp      |
| LNU953_H11                                                                                                                                                                                                                                                                                                    | oil_palm 11v1 ES323990_P1            | 2343              | 4315              | 685                | 87.5 globlastp       |
| LNU953_H12                                                                                                                                                                                                                                                                                                    | banana 12v1 IBBS995T3_P1             | 2344              | 4316              | 685                | 87.4 globlastp       |
| LNU953_H13                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI025878M_P1 | 2345              | 4317              | 685                | 87.4 globlastp       |
| LNU953_H14                                                                                                                                                                                                                                                                                                    | aristochia 10v1 FD752686_P1          | 2346              | 4318              | 685                | 87.1 globlastp       |
| LNU953_H15                                                                                                                                                                                                                                                                                                    | amborella 12v3 FD433166_P1           | 2347              | 4319              | 685                | 86.8 globlastp       |
| LNU953_H16                                                                                                                                                                                                                                                                                                    | banana 12v1 ES434911_P1              | 2348              | 4320              | 685                | 86.3 globlastp       |
| LNU953_H18                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA02G43930_P1        | 2349              | 4321              | 685                | 86.1 globlastp       |
| LNU953_H17                                                                                                                                                                                                                                                                                                    | pigeonpea 11v1 SRR054580X101829_P1   | 2350              | 4322              | 685                | 85.8 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                        |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                   | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU953_H18                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA14G04890             | 2351              | 4323              | 685                | 85.8 globlastp       |
| LNU953_H19                                                                                                                                                                                                                                                                                                    | strawberry 11v1 CO379742               | 2352              | 4324              | 685                | 85.7 globlastp       |
| LNU953_H20                                                                                                                                                                                                                                                                                                    | lotus 09v1 GFXAP006535X8_P1            | 2353              | 4325              | 685                | 85.5 globlastp       |
| LNU953_H21                                                                                                                                                                                                                                                                                                    | medicago 12v1 BE204582_P1              | 2354              | 4326              | 685                | 85.5 globlastp       |
| LNU953_H22                                                                                                                                                                                                                                                                                                    | poppy 11v1 SRR030259.226807_T1         | 2355              | 4327              | 685                | 85.49 globlastn      |
| LNU953_H126                                                                                                                                                                                                                                                                                                   | castorbean 12v1 XM_002514388_T1        | 2356              | 4328              | 685                | 85.47 globlastn      |
| LNU953_H24                                                                                                                                                                                                                                                                                                    | cotton 11v1 AI725579_P1                | 2357              | 4329              | 685                | 85.4 globlastp       |
| LNU953_H25                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 AI725579_P1   | 2358              | 4330              | 685                | 85.3 globlastp       |
| LNU953_H26                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA02G43930             | 2359              | 4331              | 685                | 85.3 globlastp       |
| LNU953_H27                                                                                                                                                                                                                                                                                                    | watermelon 11v1 AM738852               | 2360              | 4332              | 685                | 85.3 globlastp       |
| LNU953_H28                                                                                                                                                                                                                                                                                                    | prunus 10v1 BU575191                   | 2361              | 4333              | 685                | 85.2 globlastp       |
| LNU953_H127                                                                                                                                                                                                                                                                                                   | soybean 12v1 GLYMA14G04890_P1          | 2362              | 4334              | 685                | 85.1 globlastp       |
| LNU953_H29                                                                                                                                                                                                                                                                                                    | trigonella 11v1 SRR066194X104042       | 2363              | 4335              | 685                | 85.1 globlastp       |
| LNU953_H128                                                                                                                                                                                                                                                                                                   | bean 12v2 CA899898_P1                  | 2364              | 4336              | 685                | 85 globlastp         |
| LNU953_H129                                                                                                                                                                                                                                                                                                   | bean 12v2 CB542475_P1                  | 2365              | 4337              | 685                | 85 globlastp         |
| LNU953_H130                                                                                                                                                                                                                                                                                                   | poplar 13v1 AI162526_P1                | 2366              | 4338              | 685                | 85 globlastp         |
| LNU953_H30                                                                                                                                                                                                                                                                                                    | bean 12v1 CB542475                     | 2367              | 4339              | 685                | 85 globlastp         |
| LNU953_H31                                                                                                                                                                                                                                                                                                    | cassava 09v1 CK650982_P1               | 2368              | 4340              | 685                | 85 globlastp         |
| LNU953_H35                                                                                                                                                                                                                                                                                                    | poplar 13v1 AI162784_P1                | 2369              | 4341              | 685                | 85 globlastp         |
| LNU953_H32                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE403992                    | 2370              | 4342              | 685                | 84.94 globlastn      |
| LNU953_H33                                                                                                                                                                                                                                                                                                    | banana 12v1 ES435104_P1                | 2371              | 4343              | 685                | 84.9 globlastp       |
| LNU953_H34                                                                                                                                                                                                                                                                                                    | euphorbia 11v1 BG467380_P1             | 2372              | 4344              | 685                | 84.9 globlastp       |
| LNU953_H35                                                                                                                                                                                                                                                                                                    | poplar 10v1 AI162784                   | 2373              | 4345              | 685                | 84.9 globlastp       |
| LNU953_H37                                                                                                                                                                                                                                                                                                    | chickpea 13v2 GR396199_P1              | 2374              | 4346              | 685                | 84.9 globlastp       |
| LNU953_H64                                                                                                                                                                                                                                                                                                    | poplar 13v1 BU815471_P1                | 2375              | 4347              | 685                | 84.9 globlastp       |
| LNU953_H36                                                                                                                                                                                                                                                                                                    | medicago 12v1 AW684864_P1              | 2376              | 4348              | 685                | 84.8 globlastp       |
| LNU953_H37                                                                                                                                                                                                                                                                                                    | chickpea 11v1 GR396199                 | 2377              | 4349              | 685                | 84.77 globlastn      |
| LNU953_H38                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA20G11300             | 2378              | 4350              | 685                | 84.7 globlastp       |
| LNU953_H39                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE606346                    | 2379              | 4351              | 685                | 84.7 globlastp       |
| LNU953_H131                                                                                                                                                                                                                                                                                                   | poplar 13v1 BU820987_P1                | 2380              | 4352              | 685                | 84.6 globlastp       |
| LNU953_H40                                                                                                                                                                                                                                                                                                    | aquilegia 10v2 DR913332_P1             | 2381              | 4353              | 685                | 84.6 globlastp       |
| LNU953_H41                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149229.10069_P1       | 2382              | 4354              | 685                | 84.6 globlastp       |
| LNU953_H42                                                                                                                                                                                                                                                                                                    | trigonella 11v1 SRR066194X163258       | 2383              | 4355              | 685                | 84.59 globlastn      |
| LNU953_H43                                                                                                                                                                                                                                                                                                    | abies 11v2 SRR098676X111217_P1         | 2384              | 4356              | 685                | 84.5 globlastp       |
| LNU953_H44                                                                                                                                                                                                                                                                                                    | eucalyptus 11v2 CD668448_P1            | 2385              | 4357              | 685                | 84.5 globlastp       |
| LNU953_H45                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149229.216232_P1      | 2386              | 4358              | 685                | 84.5 globlastp       |
| LNU953_H46                                                                                                                                                                                                                                                                                                    | grape 11v1 GSVIVT01034603001_P1        | 2387              | 4359              | 685                | 84.5 globlastp       |
| LNU953_H47                                                                                                                                                                                                                                                                                                    | euphorbia 11v1 DV127429_T1             | 2388              | 4360              | 685                | 84.49 globlastn      |
| LNU953_H48                                                                                                                                                                                                                                                                                                    | sunflower 12v1 CX947317                | 2389              | 4361              | 685                | 84.4 globlastp       |
| LNU953_H49                                                                                                                                                                                                                                                                                                    | beech 11v1 SRR006293.655_T1            | 2390              | 4362              | 685                | 84.33 globlastn      |
| LNU953_H132                                                                                                                                                                                                                                                                                                   | prunus_mume 13v1 BU575191_P1           | 2391              | 4363              | 685                | 84.3 globlastp       |
| LNU953_H50                                                                                                                                                                                                                                                                                                    | apple 11v1 CN444562_P1                 | 2392              | 4364              | 685                | 84.3 globlastp       |
| LNU953_H51                                                                                                                                                                                                                                                                                                    | cassava 09v1 CK645234_P1               | 2393              | 4365              | 685                | 84.3 globlastp       |
| LNU953_H52                                                                                                                                                                                                                                                                                                    | clementine 11v1 BQ623766_P1            | 2394              | 4366              | 685                | 84.3 globlastp       |
| LNU953_H53                                                                                                                                                                                                                                                                                                    | pine 10v2 BF220411_P1                  | 2395              | 4367              | 685                | 84.3 globlastp       |
| LNU953_H54                                                                                                                                                                                                                                                                                                    | clementine 11v1 CB292767_P1            | 2396              | 4368              | 685                | 84.2 globlastp       |
| LNU953_H55                                                                                                                                                                                                                                                                                                    | cucumber 09v1 AM731249_P1              | 2397              | 4369              | 685                | 84.2 globlastp       |
| LNU953_H56                                                                                                                                                                                                                                                                                                    | orange 11v1 BQ623766_P1                | 2398              | 4370              | 685                | 84.2 globlastp       |
| LNU953_H57                                                                                                                                                                                                                                                                                                    | aquilegia 10v2 DR25985_P1              | 2399              | 4371              | 685                | 84.1 globlastp       |
| LNU953_H58                                                                                                                                                                                                                                                                                                    | banana 12v1 ES431466_P1                | 2400              | 4372              | 685                | 84.1 globlastp       |
| LNU953_H133                                                                                                                                                                                                                                                                                                   | castorbean 12v1 XM_002524074_P1        | 2401              | 4373              | 685                | 84 globlastp         |
| LNU953_H60                                                                                                                                                                                                                                                                                                    | strawberry 11v1 DY674421               | 2402              | 4374              | 685                | 84 globlastp         |
| LNU953_H61                                                                                                                                                                                                                                                                                                    | valeriana 11v1 SRR099039X12407         | 2403              | 4375              | 685                | 84 globlastp         |
| LNU953_H62                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346935.108676_T1      | 2404              | 4376              | 685                | 83.96 globlastn      |
| LNU953_H63                                                                                                                                                                                                                                                                                                    | cotton 11v1 BE052039XX1_T1             | 2405              | 4377              | 685                | 83.7 globlastn       |
| LNU953_H64                                                                                                                                                                                                                                                                                                    | poplar 10v1 BU815471                   | 2406              | 4378              | 685                | 83.7 globlastp       |
| LNU953_H65                                                                                                                                                                                                                                                                                                    | sunflower 12v1 DY931792                | 2407              | 4379              | 685                | 83.7 globlastp       |
| LNU953_H66                                                                                                                                                                                                                                                                                                    | vinca 11v1 SRR098690X103474            | 2408              | 4380              | 685                | 83.7 globlastp       |
| LNU953_H134                                                                                                                                                                                                                                                                                                   | prunus_mume 13v1 BU041590_P1           | 2409              | 4381              | 685                | 83.2 globlastp       |
| LNU953_H67                                                                                                                                                                                                                                                                                                    | cephalotaxus 11v1 SRR064395X106034_P1  | 2410              | 4382              | 685                | 83.2 globlastp       |
| LNU953_H68                                                                                                                                                                                                                                                                                                    | prunus 10v1 BU041590                   | 2411              | 4383              | 685                | 83.2 globlastp       |
| LNU953_H69                                                                                                                                                                                                                                                                                                    | cacao 10v1 CU471848_T1                 | 2412              | 4384              | 685                | 82.93 globlastn      |
| LNU953_H70                                                                                                                                                                                                                                                                                                    | thellungiella_halophilum 11v1 BY808976 | 2413              | 4385              | 685                | 82.9 globlastp       |
| LNU953_H135                                                                                                                                                                                                                                                                                                   | prunus_mume 13v1 BU573002_P1           | 2414              | 4386              | 685                | 82.7 globlastp       |
| LNU953_H71                                                                                                                                                                                                                                                                                                    | cotton 11v1 DT049082_P1                | 2415              | 4387              | 685                | 82.6 globlastp       |
| LNU953_H72                                                                                                                                                                                                                                                                                                    | arabidopsis_lyrata 09v1 JGLAL020339_P1 | 2416              | 4388              | 685                | 82.5 globlastp       |
| LNU953_H73                                                                                                                                                                                                                                                                                                    | b_rapa 11v1 CX189281_P1                | 2417              | 4389              | 685                | 82.5 globlastp       |
| LNU953_H74                                                                                                                                                                                                                                                                                                    | canola 11v1 EE456851_T1                | 2418              | 4390              | 685                | 82.47 globlastn      |
| LNU953_H75                                                                                                                                                                                                                                                                                                    | eucalyptus 11v2 CU402999_P1            | 2419              | 4391              | 685                | 82.4 globlastp       |
| LNU953_H76                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 BF268450_P1   | 2420              | 4392              | 685                | 82.4 globlastp       |
| LNU953_H77                                                                                                                                                                                                                                                                                                    | vinca 11v1 SRR098690X106748            | 2421              | 4393              | 685                | 82.33 globlastn      |
| LNU953_H78                                                                                                                                                                                                                                                                                                    | b_rapa 11v1 CD814501_P1                | 2422              | 4394              | 685                | 82.3 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                         |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                    | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU953_H79                                                                                                                                                                                                                                                                                                    | chelonidionum 11v1 SRR084752X101848_P1  | 2423              | 4395              | 685                | 82.3 globlastp       |
| LNU953_H80                                                                                                                                                                                                                                                                                                    | grape 11v1 GSVIVT01022498001_T1         | 2424              | 4396              | 685                | 82.27 globlastn      |
| LNU953_H81                                                                                                                                                                                                                                                                                                    | b_rapa 11v1 CD818738_P1                 | 2425              | 4397              | 685                | 82.2 globlastp       |
| LNU953_H82                                                                                                                                                                                                                                                                                                    | canola 11v1 EE553419_P1                 | 2426              | 4398              | 685                | 82.2 globlastp       |
| LNU953_H83                                                                                                                                                                                                                                                                                                    | flaveria 11v1 SRR149229.106289_P1       | 2427              | 4399              | 685                | 82.2 globlastp       |
| LNU953_H84                                                                                                                                                                                                                                                                                                    | arnica 11v1 SRR099034X101325_T1         | 2428              | 4400              | 685                | 82.17 globlastn      |
| LNU953_H85                                                                                                                                                                                                                                                                                                    | arabidopsis 10v1 AT5G06600_P1           | 2429              | 4401              | 685                | 82.1 globlastp       |
| LNU953_H86                                                                                                                                                                                                                                                                                                    | orange 11v1 CB292767_P1                 | 2430              | 4402              | 685                | 82.1 globlastp       |
| LNU953_H87                                                                                                                                                                                                                                                                                                    | cucumber 09v1 DV737928_T1               | 2431              | 4403              | 685                | 82.05 globlastn      |
| LNU953_H88                                                                                                                                                                                                                                                                                                    | prunus 10v1 BU573002                    | 2432              | 4404              | 685                | 81.94 globlastn      |
| LNU953_H89                                                                                                                                                                                                                                                                                                    | amorphophallus 11v2 SRR089351X103224_T1 | 2433              | 4405              | 685                | 81.91 globlastn      |
| LNU953_H90                                                                                                                                                                                                                                                                                                    | millet 10v1 EVO454PM000321_P1           | 2434              | 4406              | 685                | 81.9 globlastp       |
| LNU953_H91                                                                                                                                                                                                                                                                                                    | solanum_phureja 09v1 SPHBG123815        | 2435              | 4407              | 685                | 81.9 globlastp       |
| LNU953_H92                                                                                                                                                                                                                                                                                                    | apple 11v1 CN495483_T1                  | 2436              | 4408              | 685                | 81.72 globlastn      |
| LNU953_H93                                                                                                                                                                                                                                                                                                    | distylium 11v1 SRR065077X101856_T1      | 2437              | 4409              | 685                | 81.72 globlastn      |
| LNU953_H136                                                                                                                                                                                                                                                                                                   | monkeyflower 12v1 CV519760_P1           | 2438              | 4410              | 685                | 81.7 globlastp       |
| LNU953_H94                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 AI726752_P1    | 2439              | 4411              | 685                | 81.7 globlastp       |
| LNU953_H95                                                                                                                                                                                                                                                                                                    | monkeyflower 10v1 GO978886              | 2440              | 4410              | 685                | 81.7 globlastp       |
| LNU953_H96                                                                                                                                                                                                                                                                                                    | silene 11v1 SRR096785X10574             | 2441              | 4412              | 685                | 81.7 globlastp       |
| LNU953_H97                                                                                                                                                                                                                                                                                                    | tomato 11v1 BG123815                    | 2442              | 4413              | 685                | 81.7 globlastp       |
| LNU953_H98                                                                                                                                                                                                                                                                                                    | silene 11v1 SRR096785X100325            | 2443              | 4414              | 685                | 81.69 globlastn      |
| LNU953_H99                                                                                                                                                                                                                                                                                                    | poppy 11v1 SRR030259.101122_P1          | 2444              | 4415              | 685                | 81.6 globlastp       |
| LNU953_H100                                                                                                                                                                                                                                                                                                   | arabidopsis_lyrata 09v1 JGLAL009620_P1  | 2445              | 4416              | 685                | 81.5 globlastp       |
| LNU953_H101                                                                                                                                                                                                                                                                                                   | solanum_phureja 09v1 SPHBG626752        | 2446              | 4417              | 685                | 81.5 globlastp       |
| LNU953_H102                                                                                                                                                                                                                                                                                                   | thellungiella_halophilum 11v1 BY815359  | 2447              | 4418              | 685                | 81.5 globlastp       |
| LNU953_H103                                                                                                                                                                                                                                                                                                   | poplar 10v1 BU820987                    | 2448              | 4419              | 685                | 81.41 globlastn      |
| LNU953_H104                                                                                                                                                                                                                                                                                                   | arabidopsis 10v1 AT3G11910_P1           | 2449              | 4420              | 685                | 81.4 globlastp       |
| LNU953_H105                                                                                                                                                                                                                                                                                                   | ambrosia 11v1 SRR346935.136915_T1       | 2450              | 4421              | 685                | 81.34 globlastn      |
| LNU953_H106                                                                                                                                                                                                                                                                                                   | tomato 11v1 AW030110                    | 2451              | 4422              | 685                | 81.3 globlastp       |
| LNU953_H107                                                                                                                                                                                                                                                                                                   | tomato 11v1 BG626752                    | 2452              | 4423              | 685                | 81.3 globlastp       |
| LNU953_H108                                                                                                                                                                                                                                                                                                   | valeriana 11v1 SRR099039X102728         | 2453              | 4424              | 685                | 81.21 globlastn      |
| LNU953_H137                                                                                                                                                                                                                                                                                                   | olea 13v1 SRR014463X11603D1_P1          | 2454              | 4425              | 685                | 81.2 globlastp       |
| LNU953_H109                                                                                                                                                                                                                                                                                                   | thellungiella_parvulum 11v1 BY815359    | 2455              | 4426              | 685                | 81.2 globlastp       |
| LNU953_H138                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana 12v1 AM816011_P1    | 2456              | 4427              | 685                | 81.1 globlastp       |
| LNU953_H110                                                                                                                                                                                                                                                                                                   | eucalyptus 11v2 SRR001659X101826_P1     | 2457              | 4428              | 685                | 81.1 globlastp       |
| LNU953_H111                                                                                                                                                                                                                                                                                                   | thellungiella_parvulum 11v1 BY808976    | 2458              | 4429              | 685                | 81.1 globlastp       |
| LNU953_H112                                                                                                                                                                                                                                                                                                   | poppy 11v1 SRR030259.122982_P1          | 2459              | 4430              | 685                | 81 globlastp         |
| LNU953_H113                                                                                                                                                                                                                                                                                                   | ambrosia 11v1 SRR346935.109483_T1       | 2460              | 4431              | 685                | 80.99 globlastn      |
| LNU953_H114                                                                                                                                                                                                                                                                                                   | cacao 10v1 CU631250_T1                  | 2461              | 4432              | 685                | 80.94 globlastn      |
| LNU953_H139                                                                                                                                                                                                                                                                                                   | chickpea 13v2 GR398757_P1               | 2462              | 4433              | 685                | 80.9 globlastp       |
| LNU953_H140                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana 12v1 BP749195_P1    | 2463              | 4434              | 685                | 80.9 globlastp       |
| LNU953_H115                                                                                                                                                                                                                                                                                                   | spruce 11v1 EX356361                    | 2464              | 4435              | 685                | 80.87 globlastn      |
| LNU953_H116                                                                                                                                                                                                                                                                                                   | taxus 10v1 SRR032523S0002905            | 2465              | 4436              | 685                | 80.84 globlastn      |
| LNU953_H117                                                                                                                                                                                                                                                                                                   | cannabis 12v1 GR221441_P1               | 2466              | 4437              | 685                | 80.8 globlastp       |
| LNU953_H118                                                                                                                                                                                                                                                                                                   | valeriana 11v1 SRR099039X102263         | 2467              | 4438              | 685                | 80.62 globlastn      |
| LNU953_H119                                                                                                                                                                                                                                                                                                   | canola 11v1 EE446069_P1                 | 2468              | 4439              | 685                | 80.5 globlastp       |
| LNU953_H120                                                                                                                                                                                                                                                                                                   | rice 11v1 BE230378                      | 2469              | 4440              | 685                | 80.5 globlastp       |
| LNU953_H141                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana 12v1 BP748980_P1    | 2470              | 4441              | 685                | 80.4 globlastp       |
| LNU953_H142                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana 12v1 EG649585_P1    | 2471              | 4442              | 685                | 80.4 globlastp       |
| LNU953_H143                                                                                                                                                                                                                                                                                                   | olea 13v1 SRR014463X13706D1_P1          | 2472              | 4443              | 685                | 80.4 globlastp       |
| LNU953_H144                                                                                                                                                                                                                                                                                                   | switchgrass 12v1 FE629023_P1            | 2473              | 4444              | 685                | 80.3 globlastp       |
| LNU953_H145                                                                                                                                                                                                                                                                                                   | nicotiana_benthiana 12v1 EB682588_T1    | 2474              | 4445              | 685                | 80.28 globlastn      |
| LNU953_H121                                                                                                                                                                                                                                                                                                   | brachypodium 12v1 BRADI1G56780_P1       | 2475              | 4446              | 685                | 80.2 globlastp       |
| LNU953_H122                                                                                                                                                                                                                                                                                                   | rye 12v1 DRR001012.10357                | 2476              | 4447              | 685                | 80.2 globlastp       |
| LNU953_H123                                                                                                                                                                                                                                                                                                   | amorphophallus 11v2 SRR089351X111618_T1 | 2477              | 4448              | 685                | 80.14 globlastn      |
| LNU953_H124                                                                                                                                                                                                                                                                                                   | pine 10v2 AW043162_P1                   | 2478              | 4449              | 685                | 80.1 globlastp       |
| LNU953_H125                                                                                                                                                                                                                                                                                                   | pseudotsuga 10v1 SRR065119S0024421      | 2479              | 4450              | 685                | 80.05 globlastn      |
| LNU955_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN142337_P1            | 2480              | 4451              | 687                | 92 globlastp         |
| LNU955_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 CO522570_P1                  | 2481              | 4452              | 687                | 91.5 globlastp       |
| LNU955_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI021896M_P1    | 2482              | 4453              | 687                | 90.5 globlastp       |
| LNU955_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL785019              | 2483              | 4454              | 687                | 86.7 globlastp       |
| LNU955_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL785019_P1            | 2484              | 4455              | 687                | 86.3 globlastp       |
| LNU955_H4                                                                                                                                                                                                                                                                                                     | rice 11v1 CB665557                      | 2485              | 4456              | 687                | 85.1 globlastp       |
| LNU955_H5                                                                                                                                                                                                                                                                                                     | oat 11v1 GR314727_P1                    | 2486              | 4457              | 687                | 84.3 globlastp       |
| LNU955_H14                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 SRR187771.727771_T1    | 2487              | 4458              | 687                | 83.85 globlastn      |
| LNU955_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA625652                     | 2488              | 4459              | 687                | 83.8 globlastp       |
| LNU955_H7                                                                                                                                                                                                                                                                                                     | barley 12v1 BQ659274_P1                 | 2489              | 4460              | 687                | 83.2 globlastp       |
| LNU955_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G06410_P1       | 2490              | 4461              | 687                | 83 globlastp         |
| LNU955_H9                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.117807               | 2491              | 4462              | 687                | 82.8 globlastp       |
| LNU955_H10                                                                                                                                                                                                                                                                                                    | millet 10v1 PMSLX0023357D2_P1           | 2492              | 4463              | 687                | 81.8 globlastp       |
| LNU955_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL853651_P1            | 2493              | 4464              | 687                | 81.7 globlastp       |
| LNU955_H11                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI021894M_P1    | 2494              | 4465              | 687                | 81.1 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU955_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL758990_P1         | 2495              | 4466              | 687                | 80.4          | globlastp |
| LNU957_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BI388870_P1               | 2496              | 4467              | 689                | 85.6          | globlastp |
| LNU957_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613819_T1      | 2497              | 4468              | 689                | 82.08         | globlastn |
| LNU958_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 DR801342_P1               | 2498              | 4469              | 690                | 91            | globlastp |
| LNU958_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL952819_P1         | 2499              | 4470              | 690                | 88.1          | globlastp |
| LNU958_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI022391M_P1 | 2500              | 4471              | 690                | 86.6          | globlastp |
| LNU958_H3                                                                                                                                                                                                                                                                                                     | barley 12v1 BF623458_P1              | 2501              | 4472              | 690                | 82.1          | globlastp |
| LNU958_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.18630             | 2502              | 4473              | 690                | 81.8          | globlastp |
| LNU958_H5                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G01370_P1    | 2503              | 4474              | 690                | 81.7          | globlastp |
| LNU958_H6                                                                                                                                                                                                                                                                                                     | oat 11v1 GR331570_P1                 | 2504              | 4475              | 690                | 81.7          | globlastp |
| LNU958_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187769.180209_P1 | 2505              | 4476              | 690                | 81.2          | globlastp |
| LNU958_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 C73705                     | 2506              | 4477              | 690                | 80.9          | globlastp |
| LNU959_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 SOLX00016974_P1  | 2507              | 4478              | 691                | 80.6          | globlastp |
| LNU959_H2                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA183011              | 2508              | 4479              | 691                | 80.1          | globlastp |
| LNU961_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 CF631183_P1               | 2509              | 4480              | 693                | 92.2          | globlastp |
| LNU961_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE655607_T1         | 2510              | 4481              | 693                | 91.32         | globlastn |
| LNU961_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI022987M_P1 | 2511              | 4482              | 693                | 89.4          | globlastp |
| LNU961_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE655607           | 2512              | 4483              | 693                | 88.1          | globlastp |
| LNU961_H4                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA662505                  | 2513              | 4484              | 693                | 81.7          | globlastp |
| LNU961_H5                                                                                                                                                                                                                                                                                                     | oat 11v1 GR320475_P1                 | 2514              | 4485              | 693                | 81.3          | globlastp |
| LNU961_H6                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G18310_P1    | 2515              | 4486              | 693                | 81.1          | globlastp |
| LNU961_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 C24906                     | 2516              | 4487              | 693                | 80.8          | globlastp |
| LNU963_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BE238751_P1               | 2517              | 4488              | 695                | 96.4          | globlastp |
| LNU963_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613777_P1      | 2518              | 4489              | 695                | 95.4          | globlastp |
| LNU963_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE650575_P1         | 2519              | 4490              | 695                | 90.1          | globlastp |
| LNU963_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 AA752580                   | 2520              | 4491              | 695                | 86            | globlastp |
| LNU964_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BE051847_P1               | 2521              | 4492              | 696                | 95            | globlastp |
| LNU964_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL715928_P1         | 2522              | 4493              | 696                | 94.6          | globlastp |
| LNU964_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI008583M_P1 | 2523              | 4494              | 696                | 93.5          | globlastp |
| LNU964_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 CA753376                   | 2524              | 4495              | 696                | 91.9          | globlastp |
| LNU964_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G36570_P1    | 2525              | 4496              | 696                | 90.6          | globlastp |
| LNU964_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA593860                  | 2526              | 4497              | 696                | 90            | globlastp |
| LNU964_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL715928           | 2527              | 4498              | 696                | 88.91         | globlastn |
| LNU964_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM024076_P1        | 2528              | 4499              | 696                | 84.1          | globlastp |
| LNU964_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.11081             | 2529              | 4500              | 696                | 83.98         | globlastn |
| LNU964_H9                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB04G006930             | 2530              | 4501              | 696                | 81.2          | globlastp |
| LNU964_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 CB096675                   | 2531              | 4502              | 696                | 80.87         | globlastn |
| LNU964_H13                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL988009_T1         | 2532              | 4503              | 696                | 80.64         | globlastn |
| LNU964_H11                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI017454M_P1 | 2533              | 4504              | 696                | 80.4          | globlastp |
| LNU965_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 BQ533054              | 2534              | 4505              | 697                | 91.8          | globlastp |
| LNU965_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 T12687_P1                 | 2535              | 4506              | 697                | 86.8          | globlastp |
| LNU965_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE648444_P1         | 2536              | 4507              | 697                | 82.3          | globlastp |
| LNU965_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE648444           | 2537              | 4507              | 697                | 82.3          | globlastp |
| LNU965_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612769_P1      | 2538              | 4508              | 697                | 81.6          | globlastp |
| LNU965_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL899717_T1         | 2539              | 4509              | 697                | 80.07         | globlastn |
| LNU966_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612437_P1      | 2540              | 4510              | 698                | 90            | globlastp |
| LNU966_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL704069_P1         | 2541              | 4511              | 698                | 88            | globlastp |
| LNU966_H2                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G32350_P1    | 2542              | 4512              | 698                | 82.4          | globlastp |
| LNU966_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.705384            | 2543              | 4513              | 698                | 80.82         | globlastn |
| LNU966_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.277281            | 2544              | 4514              | 698                | 80.46         | globlastn |
| LNU966_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 CD934973                  | 2545              | 4515              | 698                | 80.46         | globlastn |
| LNU966_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 BI808003                   | 2546              | 4516              | 698                | 80.4          | globlastp |
| LNU967_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 CD001313_P1               | 2547              | 4517              | 699                | 90.5          | globlastp |
| LNU967_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI005990M_P1 | 2548              | 4518              | 699                | 83.3          | globlastp |
| LNU970_H1                                                                                                                                                                                                                                                                                                     | soybean 11v1 GLYMA10G05870           | 2549              | 4519              | 702                | 98.2          | globlastp |
| LNU970_H64                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA10G05870_P1        | 2550              | 4520              | 702                | 95.6          | globlastp |
| LNU970_H2                                                                                                                                                                                                                                                                                                     | cowpea 12v1 FF384004_P1              | 2551              | 4521              | 702                | 92.3          | globlastp |
| LNU970_H3                                                                                                                                                                                                                                                                                                     | pigeonpea 11v1 GW351178_P1           | 2552              | 4522              | 702                | 92            | globlastp |
| LNU970_H65                                                                                                                                                                                                                                                                                                    | bean 12v2 CA911706_P1                | 2553              | 4523              | 702                | 91.2          | globlastp |
| LNU970_H4                                                                                                                                                                                                                                                                                                     | bean 12v1 CA911706                   | 2554              | 4523              | 702                | 91.2          | globlastp |
| LNU970_H5                                                                                                                                                                                                                                                                                                     | peanut 10v1 EE126306_P1              | 2555              | 4524              | 702                | 89.1          | globlastp |
| LNU970_H6                                                                                                                                                                                                                                                                                                     | chickpea 11v1 SRR133517.113773       | 2556              | 4525              | 702                | 88.3          | globlastp |
| LNU970_H6                                                                                                                                                                                                                                                                                                     | chickpea 13v2 SRR133517.113773_P1    | 2557              | 4525              | 702                | 88.3          | globlastp |
| LNU970_H8                                                                                                                                                                                                                                                                                                     | soybean 12v1 GLYMA19G36410_P1        | 2558              | 4526              | 702                | 88            | globlastp |
| LNU970_H7                                                                                                                                                                                                                                                                                                     | pigeonpea 11v1 SRR054580X124449_P1   | 2559              | 4527              | 702                | 87.2          | globlastp |
| LNU970_H8                                                                                                                                                                                                                                                                                                     | soybean 11v1 GLYMA19G36410           | 2560              | 4528              | 702                | 87.2          | globlastp |
| LNU970_H9                                                                                                                                                                                                                                                                                                     | medicago 12v1 AW692607_P1            | 2561              | 4529              | 702                | 86.9          | globlastp |
| LNU970_H10                                                                                                                                                                                                                                                                                                    | trigonella 11v1 SRR066194X103697     | 2562              | 4530              | 702                | 86.5          | globlastp |
| LNU970_H11                                                                                                                                                                                                                                                                                                    | soybean 11v1 GLYMA03G33680           | 2563              | 4531              | 702                | 85.8          | globlastp |
| LNU970_H11                                                                                                                                                                                                                                                                                                    | soybean 12v1 GLYMA03G33680_P1        | 2564              | 4531              | 702                | 85.8          | globlastp |
| LNU970_H12                                                                                                                                                                                                                                                                                                    | lotus 09v1 AW428709_P1               | 2565              | 4532              | 702                | 85.4          | globlastp |
| LNU970_H13                                                                                                                                                                                                                                                                                                    | poplar 10v1 CA927561                 | 2566              | 4533              | 702                | 85            | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                        |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                   | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU970_H66                                                                                                                                                                                                                                                                                                    | nicotiana_benthiana 12v1 CK284221_P1   | 2567              | 4534              | 702                | 84.3          | globlastp |
| LNU970_H14                                                                                                                                                                                                                                                                                                    | cacao 10v1 CU479946_P1                 | 2568              | 4535              | 702                | 84.3          | globlastp |
| LNU970_H15                                                                                                                                                                                                                                                                                                    | grape 11v1 GSVIVT01025656001_P1        | 2569              | 4536              | 702                | 84.3          | globlastp |
| LNU970_H16                                                                                                                                                                                                                                                                                                    | nicotiana_benthiana gb162 CK284221     | 2570              | 4534              | 702                | 84.3          | globlastp |
| LNU970_H67                                                                                                                                                                                                                                                                                                    | poplar 13v1 CA927561_P1                | 2571              | 4537              | 702                | 83.9          | globlastp |
| LNU970_H17                                                                                                                                                                                                                                                                                                    | catharanthus 11v1 EG556643_P1          | 2572              | 4538              | 702                | 83.9          | globlastp |
| LNU970_H18                                                                                                                                                                                                                                                                                                    | apple 11v1 CN580810_P1                 | 2573              | 4539              | 702                | 83.6          | globlastp |
| LNU970_H19                                                                                                                                                                                                                                                                                                    | chestnut gb170 SRR006295S0024406_P1    | 2574              | 4540              | 702                | 83.6          | globlastp |
| LNU970_H68                                                                                                                                                                                                                                                                                                    | castorbean 12v1 EG692405_P1            | 2575              | 4541              | 702                | 83.3          | globlastp |
| LNU970_H21                                                                                                                                                                                                                                                                                                    | clementine 11v1 CF504408_P1            | 2576              | 4542              | 702                | 83.2          | globlastp |
| LNU970_H22                                                                                                                                                                                                                                                                                                    | oak 10v1 FP025429_P1                   | 2577              | 4543              | 702                | 83.2          | globlastp |
| LNU970_H23                                                                                                                                                                                                                                                                                                    | orange 11v1 CF504408_P1                | 2578              | 4542              | 702                | 83.2          | globlastp |
| LNU970_H24                                                                                                                                                                                                                                                                                                    | scabiosa 11v1 SRR063723X10102          | 2579              | 4544              | 702                | 83.2          | globlastp |
| LNU970_H25                                                                                                                                                                                                                                                                                                    | beech 11v1 SRR006293.15215_T1          | 2580              | 4545              | 702                | 82.91         | globlastp |
| LNU970_H69                                                                                                                                                                                                                                                                                                    | prunus_mume 13v1 DN553660_P1           | 2581              | 4546              | 702                | 82.9          | globlastp |
| LNU970_H70                                                                                                                                                                                                                                                                                                    | nicotiana_benthiana 12v1 EH664749_P1   | 2582              | 4547              | 702                | 82.8          | globlastp |
| LNU970_H71                                                                                                                                                                                                                                                                                                    | olea 13v1 SRR014463X18544D1_P1         | 2583              | 4548              | 702                | 82.8          | globlastp |
| LNU970_H26                                                                                                                                                                                                                                                                                                    | amsonia 11v1 SRR098688X105338_P1       | 2584              | 4549              | 702                | 82.8          | globlastp |
| LNU970_H27                                                                                                                                                                                                                                                                                                    | liquorice gb171 FS241348_P1            | 2585              | 4550              | 702                | 82.8          | globlastp |
| LNU970_H28                                                                                                                                                                                                                                                                                                    | poplar 10v1 AI163995_P1                | 2586              | 4551              | 702                | 82.8          | globlastp |
| LNU970_H28                                                                                                                                                                                                                                                                                                    | poplar 13v1 AI163995_P1                | 2587              | 4552              | 702                | 82.8          | globlastp |
| LNU970_H29                                                                                                                                                                                                                                                                                                    | tabernaemontana 11v1 SRR098689X105363  | 2588              | 4553              | 702                | 82.8          | globlastp |
| LNU970_H30                                                                                                                                                                                                                                                                                                    | strawberry 11v1 CO380524               | 2589              | 4554              | 702                | 82.6          | globlastp |
| LNU970_H72                                                                                                                                                                                                                                                                                                    | nicotiana_benthiana 12v1 EB425526_P1   | 2590              | 4555              | 702                | 82.5          | globlastp |
| LNU970_H31                                                                                                                                                                                                                                                                                                    | blueberry 12v1 SRR353282X4041D1_P1     | 2591              | 4556              | 702                | 82.5          | globlastp |
| LNU970_H32                                                                                                                                                                                                                                                                                                    | eucalyptus 11v2 CT980284_P1            | 2592              | 4557              | 702                | 82.5          | globlastp |
| LNU970_H33                                                                                                                                                                                                                                                                                                    | lotus 09v1 DC596145_P1                 | 2593              | 4558              | 702                | 82.5          | globlastp |
| LNU970_H34                                                                                                                                                                                                                                                                                                    | prunus 10v1 CN580810                   | 2594              | 4559              | 702                | 82.2          | globlastp |
| LNU970_H35                                                                                                                                                                                                                                                                                                    | tobacco gb162 EB425526                 | 2595              | 4560              | 702                | 82.1          | globlastp |
| LNU970_H36                                                                                                                                                                                                                                                                                                    | tripterygium 11v1 SRR098677X12467      | 2596              | 4561              | 702                | 82.1          | globlastp |
| LNU970_H37                                                                                                                                                                                                                                                                                                    | momordica 10v1 SRR071315S0003149_P1    | 2597              | 4562              | 702                | 81.8          | globlastp |
| LNU970_H38                                                                                                                                                                                                                                                                                                    | nasturtium 11v1 SRR032558.101335_P1    | 2598              | 4563              | 702                | 81.8          | globlastp |
| LNU970_H39                                                                                                                                                                                                                                                                                                    | cleome_spinoso 10v1 GR933144_T1        | 2599              | 4564              | 702                | 81.75         | globlastp |
| LNU970_H40                                                                                                                                                                                                                                                                                                    | cotton 11v1 AW186771_P1                | 2600              | 4565              | 702                | 81.6          | globlastp |
| LNU970_H73                                                                                                                                                                                                                                                                                                    | olea 13v1 SRR014463X10063D1_P1         | 2601              | 4566              | 702                | 81.4          | globlastp |
| LNU970_H41                                                                                                                                                                                                                                                                                                    | valeriana 11v1 SRR099039X116523        | 2602              | 4567              | 702                | 81.4          | globlastp |
| LNU970_H42                                                                                                                                                                                                                                                                                                    | watermelon 11v1 AM726470               | 2603              | 4568              | 702                | 81.4          | globlastp |
| LNU970_H43                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 AW186771_P1   | 2604              | 4569              | 702                | 81.2          | globlastp |
| LNU970_H44                                                                                                                                                                                                                                                                                                    | euonymus 11v1 SRR070038X13639_P1       | 2605              | 4570              | 702                | 81.1          | globlastp |
| LNU970_H45                                                                                                                                                                                                                                                                                                    | euonymus 11v1 SRR070038X296196_P1      | 2606              | 4571              | 702                | 81.1          | globlastp |
| LNU970_H46                                                                                                                                                                                                                                                                                                    | triphyssaria 10v1 DR170439             | 2607              | 4572              | 702                | 81.1          | globlastp |
| LNU970_H47                                                                                                                                                                                                                                                                                                    | cassava 09v1 JGICASSAVA23572VALIDM1_P1 | 2608              | 4573              | 702                | 81            | globlastp |
| LNU970_H48                                                                                                                                                                                                                                                                                                    | kiwi gb166 FG404513_P1                 | 2609              | 4574              | 702                | 81            | globlastp |
| LNU970_H49                                                                                                                                                                                                                                                                                                    | solanum_phureja 09v1 SPHBG135560       | 2610              | 4575              | 702                | 81            | globlastp |
| LNU970_H50                                                                                                                                                                                                                                                                                                    | cotton 11v1 CO081144_P1                | 2611              | 4576              | 702                | 80.9          | globlastp |
| LNU970_H51                                                                                                                                                                                                                                                                                                    | gossypium_raimondii 12v1 AI728093_P1   | 2612              | 4577              | 702                | 80.9          | globlastp |
| LNU970_H52                                                                                                                                                                                                                                                                                                    | medicago 12v1 CA990040_P1              | 2613              | 4578              | 702                | 80.7          | globlastp |
| LNU970_H53                                                                                                                                                                                                                                                                                                    | tomato 11v1 BG135560                   | 2614              | 4579              | 702                | 80.7          | globlastp |
| LNU970_H54                                                                                                                                                                                                                                                                                                    | vinca 11v1 SRR098690X104684            | 2615              | 4580              | 702                | 80.7          | globlastp |
| LNU970_H55                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346935.110771_P1      | 2616              | 4581              | 702                | 80.4          | globlastp |
| LNU970_H56                                                                                                                                                                                                                                                                                                    | cotton 11v1 AI728093_P1                | 2617              | 4582              | 702                | 80.4          | globlastp |
| LNU970_H57                                                                                                                                                                                                                                                                                                    | guizotia 10v1 GE557045_P1              | 2618              | 4583              | 702                | 80.4          | globlastp |
| LNU970_H58                                                                                                                                                                                                                                                                                                    | sunflower 12v1 DY912319                | 2619              | 4584              | 702                | 80.4          | globlastp |
| LNU970_H59                                                                                                                                                                                                                                                                                                    | coffea 10v1 DV663991_P1                | 2620              | 4585              | 702                | 80.3          | globlastp |
| LNU970_H60                                                                                                                                                                                                                                                                                                    | cucurbita 11v1 SRR091276X125648_P1     | 2621              | 4586              | 702                | 80.3          | globlastp |
| LNU970_H61                                                                                                                                                                                                                                                                                                    | cucumber 09v1 AM726470_T1              | 2622              | 4587              | 702                | 80.29         | globlastp |
| LNU970_H62                                                                                                                                                                                                                                                                                                    | sunflower 12v1 CD856036                | 2623              | 4588              | 702                | 80.1          | globlastp |
| LNU970_H63                                                                                                                                                                                                                                                                                                    | cynara gb167 GE590124_P1               | 2624              | 4589              | 702                | 80            | globlastp |
| LNU971_H1                                                                                                                                                                                                                                                                                                     | tomato 11v1 AI487766                   | 2625              | 4590              | 703                | 91.9          | globlastp |
| LNU971_H2                                                                                                                                                                                                                                                                                                     | tomato 11v1 BG132158                   | 2626              | 4591              | 703                | 91.7          | globlastp |
| LNU971_H3                                                                                                                                                                                                                                                                                                     | tomato 11v1 BG589613                   | 2627              | 4591              | 703                | 91.7          | globlastp |
| LNU971_H4                                                                                                                                                                                                                                                                                                     | solanum_phureja 09v1 SPHAI487915       | 2628              | 4592              | 703                | 89.5          | globlastp |
| LNU971_H5                                                                                                                                                                                                                                                                                                     | tomato 11v1 AW218573                   | 2629              | 4593              | 703                | 89.41         | globlastp |
| LNU971_H6                                                                                                                                                                                                                                                                                                     | solanum_phureja 09v1 SPHAI777070       | 2630              | 4594              | 703                | 87.66         | globlastp |
| LNU971_H7                                                                                                                                                                                                                                                                                                     | solanum_phureja 09v1 SPHDN168697       | 2631              | 4594              | 703                | 87.66         | globlastp |
| LNU971_H8                                                                                                                                                                                                                                                                                                     | solanum_phureja 09v1 SPHBG125614       | 2632              | 4595              | 703                | 87.5          | globlastp |
| LNU971_H9                                                                                                                                                                                                                                                                                                     | tomato 11v1 AI777070                   | 2633              | 4596              | 703                | 86.8          | globlastp |
| LNU971_H10                                                                                                                                                                                                                                                                                                    | potato 10v1 BQ514990_T1                | 2634              | 4597              | 703                | 86.36         | globlastp |
| LNU971_H11                                                                                                                                                                                                                                                                                                    | solanum_phureja 09v1 SPHAI772789       | 2635              | 4598              | 703                | 86.31         | globlastp |
| LNU971_H12                                                                                                                                                                                                                                                                                                    | solanum_phureja 09v1 SPHBI431905       | 2636              | 4599              | 703                | 85.71         | globlastp |
| LNU971_H13                                                                                                                                                                                                                                                                                                    | potato 10v1 BI431905_P1                | 2637              | 4600              | 703                | 85.5          | globlastp |
| LNU971_H14                                                                                                                                                                                                                                                                                                    | potato 10v1 CV475926_T1                | 2638              | 4601              | 703                | 85.47         | globlastp |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU971_H15                                                                                                                                                                                                                                                                                                    | solanum_phureja 09v1 SPHBG132158     | 2639              | 4602              | 703                | 85.4 globlastp       |
| LNU971_H16                                                                                                                                                                                                                                                                                                    | solanum_phureja 09v1 SPHAI776714     | 2640              | 4603              | 703                | 85.3 globlastp       |
| LNU971_H17                                                                                                                                                                                                                                                                                                    | eggplant 10v1 FS009193_P1            | 2641              | 4604              | 703                | 84 globlastp         |
| LNU971_H18                                                                                                                                                                                                                                                                                                    | potato 10v1 BG589613_P1              | 2642              | 4605              | 703                | 83.8 globlastp       |
| LNU971_H19                                                                                                                                                                                                                                                                                                    | tomato 11v1 SRR027939S0232941        | 2643              | 4606              | 703                | 82.9 globlastp       |
| LNU971_H22                                                                                                                                                                                                                                                                                                    | nicotiana_benthiana 12v1 AM836977_T1 | 2644              | 4607              | 703                | 82.13 globlastn      |
| LNU971_H20                                                                                                                                                                                                                                                                                                    | tomato 11v1 BG125614                 | 2645              | 4608              | 703                | 81.5 globlastp       |
| LNU971_H21                                                                                                                                                                                                                                                                                                    | pepper 12v1 BM061037_P1              | 2646              | 4609              | 703                | 80.9 globlastp       |
| LNU972_H2                                                                                                                                                                                                                                                                                                     | nicotiana_benthiana 12v1 EB699638_P1 | 2647              | 4610              | 704                | 91.4 globlastp       |
| LNU975_H1                                                                                                                                                                                                                                                                                                     | solanum_phureja 09v1 SPHBI422101     | 2648              | 4611              | 705                | 85.2 globlastn       |
| LNU975_H2                                                                                                                                                                                                                                                                                                     | solanum_phureja 09v1 SPHAI896166_T1  | 2649              | 4612              | 705                | 80.17 globlastn      |
| LNU976_H1                                                                                                                                                                                                                                                                                                     | pseudoeugenia gb167 FF347407         | 2650              | 4613              | 706                | 93.2 globlastp       |
| LNU976_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.364991            | 2651              | 4614              | 706                | 91.47 globlastn      |
| LNU976_H3                                                                                                                                                                                                                                                                                                     | leymus gb166 CD808542_P1             | 2652              | 4615              | 706                | 89.9 globlastp       |
| LNU977_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 BM137333                  | 2653              | 4616              | 707                | 86.1 globlastp       |
| LNU977_H10                                                                                                                                                                                                                                                                                                    | rice 11v1 C91689_P1                  | 2654              | 4617              | 707                | 81.5 globlastp       |
| LNU977_H11                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB01G048800_P1          | 2655              | 4618              | 707                | 80.7 globlastp       |
| LNU977_H12                                                                                                                                                                                                                                                                                                    | maize 10v1 CO519634_T1               | 2656              | 4619              | 707                | 80.23 globlastn      |
| LNU750_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BQ744292                  | 2657              | 4620              | 713                | 89.2 globlastp       |
| LNU750_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.14416             | 2658              | 4621              | 713                | 88.8 globlastp       |
| LNU771_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BM068568                  | 2659              | 4622              | 715                | 96.7 globlastp       |
| LNU771_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001013.372156            | 2660              | 4623              | 715                | 87.38 globlastn      |
| LNU771_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE426855                  | 2661              | 4624              | 715                | 84.3 globlastp       |
| LNU771_H4                                                                                                                                                                                                                                                                                                     | fescue gb161 DT701171_P1             | 2662              | 4625              | 715                | 84 globlastp         |
| LNU771_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.320596            | 2663              | 4626              | 715                | 82.4 globlastp       |
| LNU771_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001017.1352396           | 2664              | 4627              | 715                | 81.6 globlastp       |
| LNU772_H7                                                                                                                                                                                                                                                                                                     | lilium 10v1 EY457993_T1              | 2665              | 4628              | 716                | 91.41 globlastn      |
| LNU772_H12                                                                                                                                                                                                                                                                                                    | sorghum 12v1 CD209835                | 2666              | 4629              | 716                | 87.5 globlastn       |
| LNU785_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.10208             | 2667              | 4630              | 717                | 95.63 globlastn      |
| LNU785_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA653207                  | 2668              | 4631              | 717                | 89.2 globlastp       |
| LNU786_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BJ222677                  | 2669              | 4632              | 718                | 94.89 globlastn      |
| LNU786_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.114677            | 2670              | 4633              | 718                | 93.69 globlastn      |
| LNU786_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G52470_T1    | 2671              | 4634              | 718                | 86.3 globlastn       |
| LNU786_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR400820X100908D1        | 2672              | 4635              | 718                | 84.9 globlastn       |
| LNU786_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA500094                  | 2673              | 4636              | 718                | 83.88 globlastn      |
| LNU786_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 AU062764                   | 2674              | 4637              | 718                | 81.85 globlastn      |
| LNU786_H8                                                                                                                                                                                                                                                                                                     | maize 10v1 AW076421_T1               | 2675              | 4638              | 718                | 81.29 globlastn      |
| LNU786_H9                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI016091M_T1 | 2676              | 4639              | 718                | 81.18 globlastn      |
| LNU786_H10                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB04G030880             | 2677              | 4640              | 718                | 80.7 globlastn       |
| LNU786_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL710092_T1         | 2678              | 4641              | 718                | 80.05 globlastn      |
| LNU787_H5                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB10G022920             | 2679              | 4642              | 719                | 85.9 globlastp       |
| LNU787_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 GD039082_T1         | 2680              | 4643              | 719                | 83.45 globlastn      |
| LNU806_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 CI312268                   | 2681              | 4644              | 721                | 84.1 globlastn       |
| LNU806_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G14530_T1    | 2682              | 4645              | 721                | 83.18 globlastn      |
| LNU806_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.245949            | 2683              | 4646              | 721                | 80.43 globlastn      |
| LNU806_H6                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA745011                  | 2684              | 4647              | 721                | 80.43 globlastn      |
| LNU837_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL706711_T1         | 2685              | 4648              | 722                | 87.5 globlastn       |
| LNU837_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI036733M_T1 | 2686              | 4649              | 722                | 83.33 globlastn      |
| LNU837_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL875810_T1         | 2687              | 4650              | 722                | 82.29 globlastn      |
| LNU837_H5                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL706712           | 2688              | 4651              | 722                | 82.29 globlastn      |
| LNU837_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL893419_T1         | 2689              | 4652              | 722                | 81.25 globlastn      |
| LNU837_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL696926           | 2690              | 4653              | 722                | 81.25 globlastn      |
| LNU837_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL696926_T1         | 2691              | 4654              | 722                | 80.21 globlastn      |
| LNU837_H7                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM106715_T1        | 2692              | 4655              | 722                | 80.21 globlastn      |
| LNU856_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI006280M_P1 | 2693              | 4656              | 726                | 91.5 globlastp       |
| LNU856_H3                                                                                                                                                                                                                                                                                                     | millet 10v1 CD725559_P1              | 2694              | 4657              | 726                | 90.5 globlastp       |
| LNU856_H4                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB05G003390             | 2695              | 4658              | 726                | 90.3 globlastp       |
| LNU856_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI017030M_P1 | 2696              | 4659              | 726                | 89.1 globlastp       |
| LNU856_H12                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL749250_P1         | 2697              | 4660              | 726                | 88.9 globlastp       |
| LNU856_H6                                                                                                                                                                                                                                                                                                     | maize 10v1 BM895627_P1               | 2698              | 4661              | 726                | 87.9 globlastp       |
| LNU856_H8                                                                                                                                                                                                                                                                                                     | rice 11v1 BI811616                   | 2699              | 4662              | 726                | 84.2 globlastp       |
| LNU856_H9                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G43000_P1    | 2700              | 4663              | 726                | 82.4 globlastp       |
| LNU856_H10                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI2G09570_P1    | 2701              | 4664              | 726                | 80.7 globlastp       |
| LNU856_H11                                                                                                                                                                                                                                                                                                    | barley 12v1 BI949641_T1              | 2702              | 4665              | 726                | 80.08 globlastn      |
| LNU862_H10                                                                                                                                                                                                                                                                                                    | sugarcane 10v1 CA147410              | 2703              | 4666              | 728                | 84.3 globlastp       |
| LNU862_H13                                                                                                                                                                                                                                                                                                    | maize 10v1 BU037296_P1               | 2704              | 4667              | 728                | 81.9 globlastp       |
| LNU862_H15                                                                                                                                                                                                                                                                                                    | barley 12v1 AV921382_T1              | 2705              | 4668              | 728                | 80.84 globlastn      |
| LNU866_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB12V1CUFF392T1P3       | 2706              | 4669              | 729                | 95 globlastp         |
| LNU866_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AI854982_P1               | 2707              | 4670              | 729                | 88.9 globlastp       |
| LNU866_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034627M_P1 | 2708              | 4671              | 729                | 83.2 globlastp       |
| LNU866_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM024441_T1        | 2709              | 4672              | 729                | 80.82 globlastn      |
| LNU870_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI034640M_P1 | 2710              | 4673              | 730                | 91.1 globlastp       |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.     |
| LNU910_H11                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL927878_T1         | 2711              | 4674              | 736                | 93.48         | glotblastn |
| LNU911_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AI622711_P1               | 2712              | 4675              | 737                | 83.6          | globlastp  |
| LNU951_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI009880M_P1 | 2713              | 4676              | 739                | 82.4          | globlastp  |
| LNU951_H2                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL765313_P1         | 2714              | 4677              | 739                | 80.3          | globlastp  |
| LNU956_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 BQ533901              | 2715              | 4678              | 741                | 93.94         | glotblastn |
| LNU956_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 AW191064_T1               | 2716              | 4679              | 741                | 87.59         | glotblastn |
| LNU956_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL728285_T1         | 2717              | 4680              | 741                | 82.79         | glotblastn |
| LNU956_H6                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM000846_T1        | 2718              | 4681              | 741                | 82.04         | glotblastn |
| LNU956_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 AA749599                   | 2719              | 4682              | 741                | 81.25         | glotblastn |
| LNU956_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G04270_T1    | 2720              | 4683              | 741                | 80            | glotblastn |
| LNU972_H1                                                                                                                                                                                                                                                                                                     | solanum_phureja 09v1 SPHAI775263     | 2721              | 4684              | 743                | 96.6          | globlastp  |
| LNU977_H8                                                                                                                                                                                                                                                                                                     | wheat 12v3 SRR400820X1185207D1       | 2722              | 4685              | 745                | 87.8          | globlastp  |
| LNU749_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BQ905774                  | 2723              | 4686              | 747                | 93.4          | globlastp  |
| LNU749_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.593230            | 2724              | 4687              | 747                | 90.9          | globlastp  |
| LNU749_H3                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI4G10110_P1    | 2725              | 4688              | 747                | 81.4          | globlastp  |
| LNU752_H1                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.165407            | 2726              | 4689              | 748                | 96.9          | globlastp  |
| LNU752_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE415379                  | 2727              | 4690              | 748                | 96.7          | globlastp  |
| LNU766_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G59210_P1    | 2728              | 4691              | 749                | 90            | globlastp  |
| LNU769_H2                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE427519                  | 2729              | 4692              | 750                | 94.4          | globlastp  |
| LNU769_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE402340                  | 2730              | 4693              | 750                | 94.2          | globlastp  |
| LNU769_H3                                                                                                                                                                                                                                                                                                     | wheat 12v3 BQ841839                  | 2731              | 4694              | 750                | 93.7          | globlastp  |
| LNU769_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 BE705675                    | 2732              | 4695              | 750                | 92.9          | globlastp  |
| LNU769_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 CA692455                  | 2733              | 4696              | 750                | 92.5          | globlastp  |
| LNU769_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.119684            | 2734              | 4697              | 750                | 91.9          | globlastp  |
| LNU769_H7                                                                                                                                                                                                                                                                                                     | wheat 12v3 CD888102                  | 2735              | 4698              | 750                | 86.9          | globlastp  |
| LNU769_H11                                                                                                                                                                                                                                                                                                    | rice 11v1 AU030808                   | 2736              | 4699              | 750                | 82.4          | globlastp  |
| LNU769_H9                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB09G026980             | 2737              | 4700              | 750                | 82.3          | globlastp  |
| LNU769_H10                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI026215M_P1 | 2738              | 4701              | 750                | 82            | globlastp  |
| LNU769_H12                                                                                                                                                                                                                                                                                                    | maize 10v1 CD445089_P1               | 2739              | 4702              | 750                | 81.9          | globlastp  |
| LNU769_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN151230_P1         | 2740              | 4703              | 750                | 81.2          | globlastp  |
| LNU769_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 GD008102_T1         | 2741              | 4704              | 750                | 81.03         | glotblastn |
| LNU773_H6                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G001980             | 2742              | 4705              | 751                | 80.6          | globlastp  |
| LNU780_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BM137500                  | 2743              | 4706              | 753                | 81.2          | globlastp  |
| LNU784_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE406457                  | 2744              | 4707              | 754                | 84.1          | globlastp  |
| LNU784_H2                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.297633            | 2745              | 4708              | 754                | 81.7          | globlastp  |
| LNU786_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.109215            | 2746              | 4709              | 755                | 90.1          | globlastp  |
| LNU788_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI006617M_P1 | 2747              | 4710              | 756                | 83.8          | globlastp  |
| LNU804_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI009871M_P1 | 2748              | 4711              | 758                | 82.5          | globlastp  |
| LNU804_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE603029           | 2749              | 4712              | 758                | 82            | globlastp  |
| LNU804_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB06G022510             | 2750              | 4713              | 758                | 80.2          | globlastp  |
| LNU804_H4                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB06G022500_P1          | 2751              | 4714              | 758                | 80            | globlastp  |
| LNU806_H7                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187768.79981_P1  | 2752              | 4715              | 759                | 88.3          | globlastp  |
| LNU806_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 DN145288_P1         | 2753              | 4716              | 759                | 87.3          | globlastp  |
| LNU806_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB07G002850             | 2754              | 4717              | 759                | 81.3          | globlastp  |
| LNU806_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 CD966203_P1               | 2755              | 4718              | 759                | 80.6          | globlastp  |
| LNU816_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 GT091139_P1      | 2756              | 4719              | 761                | 95.8          | globlastp  |
| LNU816_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB04G029730             | 2757              | 4720              | 761                | 95.7          | globlastp  |
| LNU816_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 BQ485722_P1               | 2758              | 4721              | 761                | 95.6          | globlastp  |
| LNU816_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL715086_P1         | 2759              | 4722              | 761                | 94.6          | globlastp  |
| LNU816_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM008535_P1        | 2760              | 4723              | 761                | 94.5          | globlastp  |
| LNU816_H7                                                                                                                                                                                                                                                                                                     | rye 12v1 BF145541                    | 2761              | 4724              | 761                | 87.6          | globlastp  |
| LNU816_H8                                                                                                                                                                                                                                                                                                     | barley 12v1 AV909829_P1              | 2762              | 4725              | 761                | 86.6          | globlastp  |
| LNU816_H17                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL746777_P1         | 2763              | 4726              | 761                | 83.3          | globlastp  |
| LNU816_H9                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE400688                  | 2764              | 4727              | 761                | 82.5          | globlastp  |
| LNU816_H11                                                                                                                                                                                                                                                                                                    | wheat 12v3 TAU67717                  | 2765              | 4728              | 761                | 82            | globlastp  |
| LNU816_H12                                                                                                                                                                                                                                                                                                    | barley 12v1 EX595315_P1              | 2766              | 4729              | 761                | 81.8          | globlastp  |
| LNU816_H13                                                                                                                                                                                                                                                                                                    | wheat 12v3 SRR400820X1008111D1       | 2767              | 4730              | 761                | 80.88         | glotblastn |
| LNU816_H14                                                                                                                                                                                                                                                                                                    | wheat 12v3 SRR400820X1034615D1       | 2768              | 4731              | 761                | 80.88         | glotblastn |
| LNU816_H15                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI1G42750_P1    | 2769              | 4732              | 761                | 80.7          | globlastp  |
| LNU821_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB02G033100             | 2770              | 4733              | 764                | 95.9          | globlastp  |
| LNU821_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI029452M_P1 | 2771              | 4734              | 764                | 90.7          | globlastp  |
| LNU821_H3                                                                                                                                                                                                                                                                                                     | rice 11v1 BI808865                   | 2772              | 4735              | 764                | 82.3          | globlastp  |
| LNU821_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G28110T2_P1  | 2773              | 4736              | 764                | 81.1          | globlastp  |
| LNU824_H2                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB03G004750             | 2774              | 4737              | 765                | 96.9          | globlastp  |
| LNU824_H3                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CA072104              | 2775              | 4737              | 765                | 96.9          | globlastp  |
| LNU824_H4                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI002015M_P1 | 2776              | 4738              | 765                | 95.8          | globlastp  |
| LNU824_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL699463           | 2777              | 4739              | 765                | 95.2          | globlastp  |
| LNU824_H52                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE635824_P1         | 2778              | 4740              | 765                | 94.7          | globlastp  |
| LNU824_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 U37978                     | 2779              | 4741              | 765                | 92.7          | globlastp  |
| LNU824_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G04130_P1    | 2780              | 4742              | 765                | 91.6          | globlastp  |
| LNU824_H9                                                                                                                                                                                                                                                                                                     | barley 12v1 BI954198_P1              | 2781              | 4743              | 765                | 91.3          | globlastp  |
| LNU824_H10                                                                                                                                                                                                                                                                                                    | fescue gb161 DT698307_P1             | 2782              | 4744              | 765                | 91.3          | globlastp  |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                      |                   |                   |                    |               |           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-------------------|-------------------|--------------------|---------------|-----------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                 | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. | Algor.    |
| LNU824_H11                                                                                                                                                                                                                                                                                                    | oat 11v1 GO582430XX1_P1              | 2783              | 4745              | 765                | 91.3          | globlastp |
| LNU824_H12                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.148971            | 2784              | 4743              | 765                | 91.3          | globlastp |
| LNU824_H13                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.252020            | 2785              | 4743              | 765                | 91.3          | globlastp |
| LNU824_H14                                                                                                                                                                                                                                                                                                    | rice 11v1 AB060277                   | 2786              | 4746              | 765                | 91            | globlastp |
| LNU824_H15                                                                                                                                                                                                                                                                                                    | wheat 12v3 BE444676                  | 2787              | 4747              | 765                | 91            | globlastp |
| LNU824_H16                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.21112             | 2788              | 4748              | 765                | 90.73         | globlastn |
| LNU824_H17                                                                                                                                                                                                                                                                                                    | sorghum 12v1 SB09G005010             | 2789              | 4749              | 765                | 89.9          | globlastp |
| LNU824_H53                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN141584_P1         | 2790              | 4750              | 765                | 89.9          | globlastp |
| LNU824_H18                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI022491M_P1 | 2791              | 4751              | 765                | 89.6          | globlastp |
| LNU824_H19                                                                                                                                                                                                                                                                                                    | maize 10v1 A1783320_P1               | 2792              | 4752              | 765                | 89.6          | globlastp |
| LNU824_H20                                                                                                                                                                                                                                                                                                    | switchgrass gb167 DN141584           | 2793              | 4753              | 765                | 89.6          | globlastp |
| LNU824_H54                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FE599982_P1         | 2794              | 4753              | 765                | 89.6          | globlastp |
| LNU824_H22                                                                                                                                                                                                                                                                                                    | millet 10v1 CD725074_P1              | 2795              | 4754              | 765                | 89.3          | globlastp |
| LNU824_H23                                                                                                                                                                                                                                                                                                    | barley 12v1 B959386_P1               | 2796              | 4755              | 765                | 88.8          | globlastp |
| LNU824_H24                                                                                                                                                                                                                                                                                                    | brachypodium 12v1 BRADI2G34470_P1    | 2797              | 4756              | 765                | 88.8          | globlastp |
| LNU824_H25                                                                                                                                                                                                                                                                                                    | oat 11v1 CN816246_P1                 | 2798              | 4757              | 765                | 88.5          | globlastp |
| LNU824_H26                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.242642            | 2799              | 4758              | 765                | 88.2          | globlastp |
| LNU824_H31                                                                                                                                                                                                                                                                                                    | rye 12v1 DRR001012.153481            | 2800              | 4759              | 765                | 85.7          | globlastp |
| LNU824_H55                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 DN145318_P1         | 2801              | 4760              | 765                | 83.7          | globlastp |
| LNU824_H32                                                                                                                                                                                                                                                                                                    | cacao 10v1 CU505404_P1               | 2802              | 4761              | 765                | 82.5          | globlastp |
| LNU824_H34                                                                                                                                                                                                                                                                                                    | sugarcane 10v1 CA084205              | 2803              | 4762              | 765                | 82.3          | globlastp |
| LNU824_H33                                                                                                                                                                                                                                                                                                    | euonymus 11v1 SRR070038X188424_P1    | 2804              | 4763              | 765                | 82.1          | globlastp |
| LNU824_H35                                                                                                                                                                                                                                                                                                    | grape 11v1 GSVIVT01024573001_P1      | 2805              | 4764              | 765                | 81.8          | globlastp |
| LNU824_H36                                                                                                                                                                                                                                                                                                    | orange 11v1 CF418875_P1              | 2806              | 4765              | 765                | 81.6          | globlastp |
| LNU824_H43                                                                                                                                                                                                                                                                                                    | tripterygium 11v1 SRR098677X105610   | 2807              | 4766              | 765                | 81.01         | globlastn |
| LNU824_H38                                                                                                                                                                                                                                                                                                    | euphorbia 11v1 DV129031_P1           | 2808              | 4767              | 765                | 81            | globlastp |
| LNU824_H39                                                                                                                                                                                                                                                                                                    | papaya gb165 EX228132_P1             | 2809              | 4768              | 765                | 81            | globlastp |
| LNU824_H40                                                                                                                                                                                                                                                                                                    | amborella 12v3 CK763625_P1           | 2810              | 4769              | 765                | 80.8          | globlastp |
| LNU824_H48                                                                                                                                                                                                                                                                                                    | grape 11v1 GSVIVT01032677001_P1      | 2811              | 4770              | 765                | 80.8          | globlastp |
| LNU824_H56                                                                                                                                                                                                                                                                                                    | castorbean 12v1 EE260514_P1          | 2812              | 4771              | 765                | 80.8          | globlastp |
| LNU824_H46                                                                                                                                                                                                                                                                                                    | ambrosia 11v1 SRR346935.200226_P1    | 2813              | 4772              | 765                | 80.7          | globlastp |
| LNU824_H44                                                                                                                                                                                                                                                                                                    | cotton 11v1 CO077706_P1              | 2814              | 4773              | 765                | 80.6          | globlastp |
| LNU824_H45                                                                                                                                                                                                                                                                                                    | gossypium_razmondi 12v1 BE054298_P1  | 2815              | 4773              | 765                | 80.6          | globlastp |
| LNU824_H51                                                                                                                                                                                                                                                                                                    | beech 11v1 SRR006293.9817_T1         | 2816              | 4774              | 765                | 80.39         | globlastn |
| LNU824_H50                                                                                                                                                                                                                                                                                                    | cotton 11v1 BE054298_P1              | 2817              | 4775              | 765                | 80.3          | globlastp |
| LNU824_H57                                                                                                                                                                                                                                                                                                    | chestnut gb170 SRR006295S0038807_P1  | 2818              | 4776              | 765                | 80.2          | globlastp |
| LNU824_H58                                                                                                                                                                                                                                                                                                    | eucalyptus 11v2 CB967757_P1          | 2819              | 4777              | 765                | 80.2          | globlastp |
| LNU824_H59                                                                                                                                                                                                                                                                                                    | amsonia 11v1 SRR098688X158094_T1     | 2820              | 4778              | 765                | 80.17         | globlastn |
| LNU829_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 SRR014550S0010991_T1      | 2821              | 4779              | 767                | 94.63         | globlastn |
| LNU829_H3                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 CF572667              | 2822              | 4780              | 767                | 94.48         | globlastn |
| LNU829_H8                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187765.561639_P1 | 2823              | 4781              | 767                | 93.8          | globlastp |
| LNU829_H6                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB12V2PRD006827         | 2824              | 4782              | 767                | 90            | globlastn |
| LNU829_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 AF171223                   | 2825              | 4783              | 767                | 81.4          | globlastp |
| LNU831_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB01G011000             | 2826              | 4784              | 768                | 84.92         | globlastn |
| LNU831_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI036219M_P1 | 2827              | 4785              | 768                | 84.1          | globlastp |
| LNU833_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB02G029650             | 2828              | 4786              | 769                | 91.9          | globlastp |
| LNU833_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC612621_P1      | 2829              | 4787              | 769                | 87            | globlastp |
| LNU847_H1                                                                                                                                                                                                                                                                                                     | trigonella 11v1 SRR066194X264388     | 2830              | 4788              | 772                | 94.4          | globlastp |
| LNU847_H2                                                                                                                                                                                                                                                                                                     | soybean 12v1 GLYMA17G02680_P1        | 2831              | 4789              | 772                | 83            | globlastp |
| LNU847_H3                                                                                                                                                                                                                                                                                                     | bean 12v2 SRR001334.102552_P1        | 2832              | 4790              | 772                | 82            | globlastp |
| LNU847_H4                                                                                                                                                                                                                                                                                                     | soybean 12v1 GLYMA07G38020_P1        | 2833              | 4791              | 772                | 80.4          | globlastp |
| LNU858_H3                                                                                                                                                                                                                                                                                                     | maize 10v1 BM266633_P1               | 2834              | 4792              | 774                | 93.5          | globlastp |
| LNU858_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 A1834674_P1               | 2835              | 4793              | 774                | 90.3          | globlastp |
| LNU858_H1                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI016470M_P1 | 2836              | 4794              | 774                | 86.9          | globlastp |
| LNU858_H2                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM002436_P1        | 2837              | 4795              | 774                | 86.6          | globlastp |
| LNU858_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE613408_P1         | 2838              | 4796              | 774                | 85.2          | globlastp |
| LNU858_H6                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL693746_P1         | 2839              | 4797              | 774                | 81.8          | globlastp |
| LNU898_H1                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB04G003360             | 2840              | 4798              | 778                | 94.3          | globlastp |
| LNU898_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI017281M_P1 | 2841              | 4799              | 778                | 93.7          | globlastp |
| LNU898_H3                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM005287_P1        | 2842              | 4800              | 778                | 93.7          | globlastp |
| LNU898_H4                                                                                                                                                                                                                                                                                                     | maize 10v1 A1948259_T1               | 2843              | 4801              | 778                | 93.63         | globlastn |
| LNU898_H5                                                                                                                                                                                                                                                                                                     | maize 10v1 BQ538526_P1               | 2844              | 4802              | 778                | 93.2          | globlastp |
| LNU898_H9                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE615026_P1         | 2845              | 4803              | 778                | 92.5          | globlastp |
| LNU898_H6                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL699057           | 2846              | 4804              | 778                | 91.84         | globlastn |
| LNU898_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 BE229038                   | 2847              | 4805              | 778                | 86            | globlastp |
| LNU898_H8                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI3G03680_P1    | 2848              | 4806              | 778                | 82.9          | globlastp |
| LNU900_H7                                                                                                                                                                                                                                                                                                     | rice 11v1 AU083413                   | 2849              | 4807              | 779                | 83.4          | globlastp |
| LNU901_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AW244952_P1               | 2850              | 4808              | 780                | 90.1          | globlastp |
| LNU901_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI001444M_P1 | 2851              | 4809              | 780                | 88.8          | globlastp |
| LNU901_H4                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI2G02560T2_P1  | 2852              | 4810              | 780                | 84.5          | globlastp |
| LNU901_H5                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE606820                  | 2853              | 4811              | 780                | 83.6          | globlastp |
| LNU901_H8                                                                                                                                                                                                                                                                                                     | rye 12v1 BE586835                    | 2854              | 4812              | 780                | 82.47         | globlastn |

TABLE 2-continued

| Homologues (e.g., orthologues) of the identified genes/polypeptides for increasing nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant |                                       |                   |                   |                    |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-------------------|-------------------|--------------------|----------------------|
| Hom. Name                                                                                                                                                                                                                                                                                                     | Organism/Cluster tag                  | Polyn. SEQ ID NO: | Polyp. SEQ ID NO: | Hom. To SEQ ID NO: | Global Ident. Algor. |
| LNU901_H6                                                                                                                                                                                                                                                                                                     | rice 11v1 BI806473                    | 2855              | 4813              | 780                | 82.4 globlastp       |
| LNU901_H7                                                                                                                                                                                                                                                                                                     | barley 12v1 BI952377_P1               | 2856              | 4814              | 780                | 82.4 globlastp       |
| LNU901_H9                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.187398             | 2857              | 4815              | 780                | 81.42 glotblastn     |
| LNU904_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613499_P1       | 2858              | 4816              | 781                | 82.1 globlastp       |
| LNU906_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW055628_P1                | 2859              | 4817              | 782                | 88.2 globlastp       |
| LNU906_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 BQ703950_P1                | 2860              | 4818              | 782                | 88.2 globlastp       |
| LNU906_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI000363M_P1  | 2861              | 4819              | 782                | 84 globlastp         |
| LNU909_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI000744M_P1  | 2862              | 4820              | 784                | 84.6 globlastp       |
| LNU909_H3                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL723049            | 2863              | 4821              | 784                | 82.21 glotblastn     |
| LNU909_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL977640_T1          | 2864              | 4822              | 784                | 82.1 glotblastn      |
| LNU909_H4                                                                                                                                                                                                                                                                                                     | millet 10v1 EVO454PM008179_P1         | 2865              | 4823              | 784                | 82.1 globlastp       |
| LNU911_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI000115M_P1  | 2866              | 4824              | 785                | 85.1 globlastp       |
| LNU930_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 AW787241_P1                | 2867              | 4825              | 786                | 91.5 globlastp       |
| LNU930_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL706853_T1          | 2868              | 4826              | 786                | 83.49 glotblastn     |
| LNU930_H2                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FE618499            | 2869              | 4827              | 786                | 82.9 globlastp       |
| LNU930_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FE618499_P1          | 2870              | 4828              | 786                | 82.4 globlastp       |
| LNU930_H3                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 EC613524_P1       | 2871              | 4829              | 786                | 80.8 globlastp       |
| LNU932_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 T27560_P1                  | 2872              | 4830              | 787                | 85.1 globlastp       |
| LNU938_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 DN222454_P1                | 2873              | 4831              | 789                | 87.6 globlastp       |
| LNU938_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI027048M_P1  | 2874              | 4832              | 789                | 83.9 globlastp       |
| LNU938_H4                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 SRR187769.1104778_T1 | 2875              | 4833              | 789                | 83.33 glotblastn     |
| LNU938_H5                                                                                                                                                                                                                                                                                                     | switchgrass 12v1 FL787692_P1          | 2876              | 4834              | 789                | 82.6 globlastp       |
| LNU938_H3                                                                                                                                                                                                                                                                                                     | sorghum 12v1 SB05G025910              | 2877              | 4835              | 789                | 81.1 globlastp       |
| LNU938_H6                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI027821M_P1  | 2878              | 4836              | 789                | 80.7 globlastp       |
| LNU954_H1                                                                                                                                                                                                                                                                                                     | sugarcane 10v1 BQ533017_P1            | 2879              | 4837              | 791                | 94.2 globlastp       |
| LNU954_H2                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI022586M_P1  | 2880              | 4838              | 791                | 83 globlastp         |
| LNU954_H3                                                                                                                                                                                                                                                                                                     | cenchrus gb166 EB653183_P1            | 2881              | 4839              | 791                | 81 globlastp         |
| LNU956_H2                                                                                                                                                                                                                                                                                                     | maize 10v1 AW520032_T1                | 2882              | 4840              | 792                | 89.58 glotblastn     |
| LNU956_H4                                                                                                                                                                                                                                                                                                     | switchgrass gb167 FL701157            | 2883              | 4841              | 792                | 85.12 glotblastn     |
| LNU956_H10                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL701157_P1          | 2884              | 4842              | 792                | 83.3 globlastp       |
| LNU956_H5                                                                                                                                                                                                                                                                                                     | foxtail_millet 11v3 PHY7SI021390M_P1  | 2885              | 4843              | 792                | 82.7 globlastp       |
| LNU968_H1                                                                                                                                                                                                                                                                                                     | maize 10v1 BI233953_P1                | 2886              | 4844              | 793                | 80.7 globlastp       |
| LNU977_H4                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.145037             | 2887              | 4845              | 794                | 97.3 globlastp       |
| LNU977_H5                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.173329             | 2888              | 4846              | 794                | 96.7 globlastp       |
| LNU977_H6                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.153346             | 2889              | 4847              | 794                | 96.7 globlastp       |
| LNU977_H7                                                                                                                                                                                                                                                                                                     | barley 12v1 BF254361_P1               | 2890              | 4848              | 794                | 96.3 globlastp       |
| LNU977_H3                                                                                                                                                                                                                                                                                                     | rye 12v1 DRR001012.735828             | 2891              | 4849              | 794                | 95.89 glotblastn     |
| LNU977_H1                                                                                                                                                                                                                                                                                                     | wheat 12v3 BE398977                   | 2892              | 4850              | 794                | 93.7 globlastp       |
| LNU977_H9                                                                                                                                                                                                                                                                                                     | brachypodium 12v1 BRADI1G76830_P1     | 2893              | 4851              | 794                | 88.3 globlastp       |
| LNU977_H13                                                                                                                                                                                                                                                                                                    | millet 10v1 EVO454PM012399_T1         | 2894              | 4852              | 794                | 81.4 glotblastn      |
| LNU977_H14                                                                                                                                                                                                                                                                                                    | foxtail_millet 11v3 PHY7SI035189M_P1  | 2895              | 4853              | 794                | 80.7 globlastp       |
| LNU977_H15                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL721232_P1          | 2896              | 4854              | 794                | 80.3 globlastp       |
| LNU977_H16                                                                                                                                                                                                                                                                                                    | switchgrass 12v1 FL901810_T1          | 2897              | 4855              | 794                | 80.04 glotblastn     |

Table 2: Provided are the homologous (e.g., orthologous) polypeptides and polynucleotides of the genes identified in Table 1 and of their cloned genes, which can increase nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber quality, fiber length, abiotic stress tolerance and/or water use efficiency of a plant. Homology was calculated as % of identity over the aligned sequences. The query sequences were polypeptide sequences SEQ ID NOs: 496-794 and polynucleotide sequences SEQ ID NOs: 1-495, and the subject sequences are polypeptide sequences or polynucleotide sequences which were dynamically translated in all six reading frames identified in the database based on greater than 80% identity to the query polypeptide sequences.

"Polyp." = polypeptide; "Polyn." = Polynucleotide. Algor. = Algorithm. "globlastp"—global homology using blastp; "glotblastn"—global homology using tblastn. "Hom."—homologous. "ident" = identity.

The output of the functional genomics approach described herein is a set of genes highly predicted to improve nitrogen use efficiency, fertilizer use efficiency, yield, seed yield, growth rate, vigor, biomass, oil content, fiber yield, fiber length, fiber quality, abiotic stress tolerance and/or water use efficiency of a plant by increasing their expression.

Although each gene is predicted to have its own impact, modifying the mode of expression of more than one gene or gene product (RNA, polypeptide) is expected to provide an additive or synergistic effect on the desired trait (e.g., nitrogen use efficiency, fertilizer use efficiency, yield, growth rate, vigor, biomass, oil content, abiotic stress tolerance and/or water use efficiency of a plant). Altering the expression of each gene described here alone or of a set of genes together increases the overall yield and/or other agronomic important traits, hence expects to increase agricultural productivity.

### Example 3

#### Production of Barley Transcriptom and High Throughput Correlation Analysis Using 44K Barley Oligonucleotide Micro-Array

In order to produce a high throughput correlation analysis comparing between plant phenotype and gene expression level, the present inventors utilized a Barley oligonucleotide micro-array, produced by Agilent Technologies [chem. (dot) agilent (dot) com/Scripts/PDS (dot) asp?1Page=50879]. The array oligonucleotide represents about 47,500 Barley genes and transcripts. In order to define correlations between the levels of RNA expression and yield or vigor related parameters, various plant characteristics of 25 different Barley accessions were analyzed. Among them, 13 accessions encompassing the observed variance were selected for RNA

expression analysis. The correlation between the RNA levels and the characterized parameters was analyzed using Pearson correlation test [davidmlane (dot) com/hyperstat/A34739 (dot) html].

#### Experimental Procedures

Analyzed Barley tissues—Five tissues at different developmental stages [meristem, flower, booting spike, stem, flag leaf], representing different plant characteristics, were sampled and RNA was extracted as described above. Each micro-array expression information tissue type has received a Set ID as summarized in Table 3 below.

TABLE 3

| Barley transcriptom expression sets |        |
|-------------------------------------|--------|
| Expression Set                      | Set ID |
| booting spike                       | 1      |
| flowering spike                     | 2      |
| meristem                            | 3      |
| Stem                                | 4      |

Barley yield components and vigor related parameters assessment—25 Barley accessions in 4 repetitive blocks (named A, B, C, and D), each containing 4 plants per plot were grown at net house. Plants were phenotyped on a daily basis following the standard descriptor of barley (Table 4, below). Harvest was conducted while 50% of the spikes were dry to avoid spontaneous release of the seeds. Plants were separated to the vegetative part and spikes, of them, 5 spikes were threshed (grains were separated from the glumes) for additional grain analysis such as size measurement, grain count per spike and grain yield per spike. All material was oven dried and the seeds were threshed manually from the spikes prior to measurement of the seed characteristics (weight and size) using scanning and image analysis. The image analysis system included a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.37 (Java based image processing program, which was developed at the U.S. National Institutes of Health and freely available on the internet [rsbweb (dot) nih (dot) gov/]. Next, analyzed data was saved to text files and processed using the JMP statistical analysis software (SAS institute).

TABLE 4

| Barley standard descriptors |                 |                          |                                                                     |
|-----------------------------|-----------------|--------------------------|---------------------------------------------------------------------|
| Trait                       | Parameter       | Range                    | Description                                                         |
| Growth habit                | Scoring         | 1-9                      | Prostrate (1) or Erect (9)                                          |
| Hairiness of basal leaves   | Scoring         | P (Presence)/A (Absence) | Absence (1) or Presence (2)                                         |
| Stem pigmentation           | Scoring         | 1-5                      | Green (1), Basal only or Half or more (5)                           |
| Days to Flowering           | Days            |                          | Days from sowing to emergence of awns                               |
| Plant height                | Centimeter (cm) |                          | Height from ground level to top of the longest spike excluding awns |
| Spikes per plant            | Number          |                          | Terminal Counting                                                   |
| Spike length (cm)           | Centimeter      |                          | Terminal Counting 5 spikes per plant                                |
| Grains per spike            | Number          |                          | Terminal Counting 5 spikes per plant                                |
| Vegetative dry weight       | Gram            |                          | Oven-dried for 48 hours at 70° C.                                   |
| Spikes dry weight           | Gram            |                          | Oven-dried for 48 hours at 30° C.                                   |

Grains per spike—At the end of the experiment (50% of the spikes were dry) all spikes from plots within blocks A-D were collected. The total number of grains from 5 spikes that were manually threshed was counted. The average grain per spike was calculated by dividing the total grain number by the number of spikes.

Grain average size (cm)—At the end of the experiment (50% of the spikes were dry) all spikes from plots within blocks A-D were collected. The total grains from 5 spikes that were manually threshed were scanned and images were analyzed using the digital imaging system. Grain scanning was done using Brother scanner (model DCP-135), at the 200 dpi resolution and analyzed with Image J software. The average grain size was calculated by dividing the total grain size by the total grain number.

Grain average weight (mgr)—At the end of the experiment (50% of the spikes were dry) all spikes from plots within blocks A-D were collected. The total grains from 5 spikes that were manually threshed were counted and weight. The average weight was calculated by dividing the total weight by the total grain number.

Grain yield per spike (gr)—At the end of the experiment (50% of the spikes were dry) all spikes from plots within blocks A-D were collected. The total grains from 5 spikes that were manually threshed were weight. The grain yield was calculated by dividing the total weight by the spike number.

Spike length analysis—At the end of the experiment (50% of the spikes were dry) all spikes from plots within blocks A-D were collected. The five chosen spikes per plant were measured using measuring tape excluding the awns.

Spike number analysis—At the end of the experiment (50% of the spikes were dry) all spikes from plots within blocks A-D were collected. The spikes per plant were counted.

Growth habit scoring—At the growth stage 10 (booting), each of the plants was scored for its growth habit nature. The scale that was used was 1 for prostrate nature till 9 for erect.

Hairiness of basal leaves—At the growth stage 5 (leaf sheath strongly erect; end of tillering), each of the plants was scored for its hairiness nature of the leaf before the last. The scale that was used was 1 for prostrate nature till 9 for erect.

Plant height—At the harvest stage (50% of spikes were dry) each of the plants was measured for its height using measuring tape. Height was measured from ground level to top of the longest spike excluding awns.

Days to flowering—Each of the plants was monitored for flowering date. Days of flowering was calculated from sowing date till flowering date.

Stem pigmentation—At the growth stage 10 (booting), each of the plants was scored for its stem color. The scale that was used was 1 for green till 5 for full purple.

Vegetative dry weight and spike yield—At the end of the experiment (50% of the spikes were dry) all spikes and vegetative material from plots within blocks A-D were collected. The biomass and spikes weight of each plot was separated, measured and divided by the number of plants.

Dry weight=total weight of the vegetative portion above ground (excluding roots) after drying at 70° C. in oven for 48 hours;

Spike yield per plant=total spike weight per plant (gr) after drying at 30° C. in oven for 48 hours.

Harvest Index (for barley)—The harvest index was calculated using Formula XVIII above.

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TABLE 5

| Barley correlated parameters (vectors)  |                |    |
|-----------------------------------------|----------------|----|
| Correlated parameter with (units)       | Correlation Id |    |
| Grain weight (milligrams)               | 1              | 5  |
| Grains Size (mm <sup>2</sup> )          | 2              |    |
| Grains per spike (numbers)              | 3              |    |
| Growth habit (scores 1-9)               | 4              |    |
| Hairiness of basal leaves (scoring 1-2) | 5              |    |
| Plant height (cm)                       | 6              | 10 |
| Seed Yield of 5 Spikes (gram)           | 7              |    |
| Spike length (cm)                       | 8              |    |
| Spikes per plant (numbers)              | 9              |    |
| Stem pigmentation (scoring 1-5)         | 10             |    |
| Vegetative dry weight (gram)            | 11             | 15 |
| days to flowering (days)                | 12             |    |

## Experimental Results

13 different Barley accessions were grown and characterized for 13 parameters as described above. The average for each of the measured parameter was calculated using the JMP software and values are summarized in Tables 6 and 7 below. Subsequent correlation analysis between the various transcriptom sets (Table 3) and the average parameters, was conducted. Follow, results were integrated to the database.

TABLE 6

| Measured parameters of correlation Ids in Barley accessions |           |       |        |       |       |         |
|-------------------------------------------------------------|-----------|-------|--------|-------|-------|---------|
| Accession                                                   | Parameter |       |        |       |       |         |
|                                                             | 1         | 2     | 3      | 4     | 5     | 6       |
| Line-1                                                      | 35.046    | 0.265 | 20.229 | 2.600 | 1.533 | 134.267 |
| Line-2                                                      | 28.065    | 0.229 | 17.983 | 2.000 | 1.333 | 130.500 |
| Line-3                                                      | 28.761    | 0.244 | 17.267 | 1.923 | 1.692 | 138.769 |
| Line-4                                                      | 17.869    | 0.166 | 17.733 | 3.167 | 1.083 | 114.583 |

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TABLE 6-continued

| Measured parameters of correlation Ids in Barley accessions |           |       |        |       |       |         |
|-------------------------------------------------------------|-----------|-------|--------|-------|-------|---------|
| Accession                                                   | Parameter |       |        |       |       |         |
|                                                             | 1         | 2     | 3      | 4     | 5     | 6       |
| Line-5                                                      | 41.216    | 0.295 | 14.467 | 4.333 | 1.417 | 127.750 |
| Line-6                                                      | 29.734    | 0.275 | 16.783 | 2.692 | 1.692 | 129.385 |
| Line-7                                                      | 25.224    | 0.220 | 12.120 | 3.600 | 1.300 | 103.889 |
| Line-8                                                      | 34.994    | 0.278 | 14.067 | 3.500 | 1.188 | 121.625 |
| Line-9                                                      | 20.580    | 0.187 | 21.540 | 3.000 | 1.000 | 126.800 |
| Line-10                                                     | 27.501    | 0.224 | 12.100 | 3.667 | 1.167 | 99.833  |
| Line-11                                                     | 37.126    | 0.273 | 13.400 | 2.467 | 1.600 | 121.400 |
| Line-12                                                     | 29.564    | 0.271 | 15.283 | 3.500 | 1.083 | 118.417 |
| Line-13                                                     | 19.583    | 0.179 | 17.067 | 3.000 | 1.167 | 117.167 |

Table 6: Provided are the values of each of the parameters measured in Barley accessions according to the correlation identifications (Correlation IDs Table 5 above).

TABLE 7

| Accession/<br>Parameter | 7     | 8      | 9      | 10    | 11     | 12     |
|-------------------------|-------|--------|--------|-------|--------|--------|
| Line-1                  | 3.559 | 12.036 | 48.846 | 1.133 | 78.871 | 62.400 |
| Line-2                  | 2.538 | 10.932 | 48.273 | 2.500 | 66.141 | 64.083 |
| Line-3                  | 2.583 | 11.825 | 37.417 | 1.692 | 68.491 | 65.154 |
| Line-4                  | 1.574 | 9.900  | 61.917 | 1.750 | 53.389 | 58.917 |
| Line-5                  | 3.030 | 11.682 | 33.273 | 2.333 | 68.300 | 63.000 |
| Line-6                  | 2.517 | 11.532 | 41.692 | 2.308 | 74.173 | 70.538 |
| Line-7                  | 1.549 | 8.863  | 40.000 | 1.700 | 35.354 | 52.800 |
| Line-8                  | 2.624 | 11.216 | 40.625 | 2.188 | 58.334 | 60.875 |
| Line-9                  | 2.300 | 11.108 | 62.000 | 2.300 | 62.230 | 58.100 |
| Line-10                 | 1.678 | 8.583  | 49.333 | 1.833 | 38.322 | 53.000 |
| Line-11                 | 2.677 | 10.179 | 50.600 | 3.067 | 68.306 | 60.400 |
| Line-12                 | 2.353 | 10.505 | 43.091 | 1.583 | 56.148 | 64.583 |
| Line-13                 | 1.673 | 9.803  | 51.400 | 2.167 | 42.682 | 56.000 |

Table 7: Provided are the values of each of the parameters measured in Barley accessions according to the correlation identifications (Correlation IDs Table 5 above).

TABLE 8

| Correlation between the expression level of the selected polynucleotides of the invention and their homologues in specific tissues or developmental stages and the phenotypic performance across Barley accessions |      |          |          |              |           |      |          |          |              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|----------|--------------|-----------|------|----------|----------|--------------|
| Gene Name                                                                                                                                                                                                          | R    | P value  | Exp. set | Corr. Set ID | Gene Name | R    | P value  | Exp. set | Corr. Set ID |
| LNU750                                                                                                                                                                                                             | 0.80 | 5.15E-03 | 2        | 9            | LNU756    | 0.70 | 1.59E-02 | 3        | 2            |
| LNU756                                                                                                                                                                                                             | 0.73 | 1.05E-02 | 3        | 1            | LNU756    | 0.74 | 8.57E-03 | 3        | 5            |
| LNU757                                                                                                                                                                                                             | 0.75 | 7.80E-03 | 1        | 7            | LNU757    | 0.74 | 8.71E-03 | 1        | 11           |
| LNU761                                                                                                                                                                                                             | 0.74 | 9.03E-03 | 3        | 1            | LNU761    | 0.72 | 1.20E-02 | 3        | 6            |
| LNU761                                                                                                                                                                                                             | 0.85 | 9.78E-04 | 3        | 8            | LNU761    | 0.88 | 4.09E-04 | 3        | 7            |
| LNU761                                                                                                                                                                                                             | 0.76 | 6.14E-03 | 3        | 11           | LNU766    | 0.73 | 1.10E-02 | 1        | 5            |
| LNU767                                                                                                                                                                                                             | 0.82 | 2.06E-03 | 3        | 2            | LNU767    | 0.87 | 5.84E-04 | 3        | 1            |
| LNU767                                                                                                                                                                                                             | 0.77 | 6.08E-03 | 3        | 8            | LNU767    | 0.94 | 1.99E-05 | 3        | 7            |
| LNU767                                                                                                                                                                                                             | 0.85 | 9.09E-04 | 3        | 11           | LNU767    | 0.76 | 6.33E-03 | 3        | 12           |
| LNU768                                                                                                                                                                                                             | 0.79 | 3.98E-03 | 1        | 9            | LNU768    | 0.73 | 1.74E-02 | 2        | 4            |
| LNU768                                                                                                                                                                                                             | 0.75 | 7.84E-03 | 3        | 9            | LNU770    | 0.72 | 1.20E-02 | 1        | 9            |
| LNU771                                                                                                                                                                                                             | 0.70 | 2.32E-02 | 2        | 5            | LNU771    | 0.78 | 4.51E-03 | 3        | 2            |
| LNU771                                                                                                                                                                                                             | 0.74 | 9.02E-03 | 3        | 1            | LNU773    | 0.75 | 7.74E-03 | 3        | 9            |
| LNU774                                                                                                                                                                                                             | 0.81 | 2.78E-03 | 3        | 2            | LNU774    | 0.87 | 4.25E-04 | 3        | 1            |
| LNU774                                                                                                                                                                                                             | 0.71 | 1.36E-02 | 3        | 7            | LNU780    | 0.70 | 1.56E-02 | 1        | 2            |
| LNU780                                                                                                                                                                                                             | 0.77 | 6.07E-03 | 1        | 1            | LNU780    | 0.86 | 1.40E-03 | 2        | 4            |
| LNU782                                                                                                                                                                                                             | 0.74 | 8.54E-03 | 3        | 8            | LNU785    | 0.70 | 1.57E-02 | 1        | 8            |
| LNU834                                                                                                                                                                                                             | 0.75 | 7.95E-03 | 3        | 1            | LNU839    | 0.75 | 7.95E-03 | 3        | 1            |

Table 8: Provided are the correlations (R) and p-values (P) between the expression levels of selected genes of some embodiments of the invention in various tissues or developmental stages (Expression sets) and the phenotypic performance in various yield (seed yield, oil yield, oil content), biomass, growth rate and/or vigor components [Correlation (Corr.) vector (Vec.) Expression (Exp.)] Corr. Vector = correlation vector specified in Table 5; Exp. Set = expression set specified in Table 3.

### Production of Barley Transcriptom and High Throughput Correlation Analysis Using 60K Barley Oligonucleotide Micro-Array

In order to produce a high throughput correlation analysis comparing between plant phenotype and gene expression level, the present inventors utilized a Barley oligonucleotide micro-array, produced by Agilent Technologies [chem. (dot) agilent (dot) com/Scripts/PDS (dot) asp?1Page=50879]. The array oligonucleotide represents about 60K Barley genes and transcripts. In order to define correlations between the levels of RNA expression and yield or vigor related parameters, various plant characteristics of 15 different Barley accessions were analyzed. Among them, 10 accessions encompassing the observed variance were selected for RNA expression analysis. The correlation between the RNA levels and the characterized parameters was analyzed using Pearson correlation test [davidmlane (dot) com/hyperstat/A34739 (dot) html].

#### Experimental Procedures

Analyzed Barley tissues—Tissues at different developmental stages representing different plant characteristics, were sampled and RNA was extracted as described above. Each micro-array expression information tissue type has received a Set ID as summarized in Tables 9-11 below.

TABLE 9

| Barley transcriptom expression sets under normal and low N conditions (at vegetative stage) |        |
|---------------------------------------------------------------------------------------------|--------|
| Expression Set                                                                              | Set ID |
| Adv root/T3/low N                                                                           | 1      |
| Adv root/T3/normal                                                                          | 2      |
| Leaf/T3/low N                                                                               | 3      |
| Leaf/T3/normal                                                                              | 4      |
| Root tip/T3/low N                                                                           | 5      |
| Root tip/T3/normal                                                                          | 6      |

Table 9. Provided are the barley transcriptom expression sets under normal and low N (low nitrogen) conditions (at vegetative stage).

TABLE 10

| Barley transcriptom expression sets under normal and low N conditions (at reproductive stage) |                                   |
|-----------------------------------------------------------------------------------------------|-----------------------------------|
| Set ID                                                                                        | Expression Set                    |
| 1                                                                                             | reproductive/booting spike/low N  |
| 2                                                                                             | reproductive/booting spike/normal |
| 3                                                                                             | reproductive/leaf/low N           |
| 4                                                                                             | reproductive/leaf/normal:         |
| 5                                                                                             | reproductive/stem/low N           |
| 6                                                                                             | reproductive/stem/normal          |

Table 10. Provided are the barley transcriptom expression sets under normal and low N conditions (at reproductive stage).

TABLE 11

| Barley transcriptom expression sets under drought conditions (at vegetative stage) |                                    |
|------------------------------------------------------------------------------------|------------------------------------|
| Set ID                                                                             | Expression Set                     |
| 1                                                                                  | Drought/booting spike/reproductive |
| 2                                                                                  | Drought/leaf/reproductive          |
| 3                                                                                  | Drought/leaf/vegetative            |
| 4                                                                                  | Drought/meristems/vegetative       |

TABLE 11-continued

| Barley transcriptom expression sets under drought conditions (at vegetative stage) |                             |
|------------------------------------------------------------------------------------|-----------------------------|
| Set ID                                                                             | Expression Set              |
| 5                                                                                  | Drought/root tip/vegetative |
| 6                                                                                  | Drought/root tip/vegetative |

Table 11. Provided are the barley transcriptom expression sets under drought conditions (at vegetative stage).

Barley yield components and vigor related parameters assessment—15 Barley accessions in 5 repetitive blocks, each containing 5 plants per pot were grown at net house. Three different treatments were applied: plants were regularly fertilized and watered during plant growth until harvesting (as recommended for commercial growth, plants were irrigated 2-3 times a week, and fertilization was given in the first 1.5 months of the growth period) or under low Nitrogen (80% percent less Nitrogen) or under drought stress (cycles of drought and re-irrigating were conducted throughout the whole experiment, overall 40% less water were given in the drought treatment). Plants were phenotyped on a daily basis following the parameters listed in Table 12 below. Harvest was conducted while all the spikes were dry. All material was oven dried and the seeds were threshed manually from the spikes prior to measurement of the seed characteristics (weight and size) using scanning and image analysis. The image analysis system included a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.37 (Java based image processing program, which was developed at the U.S. National Institutes of Health and freely available on the internet [rsbweb (dot) nih (dot) gov/]. Next, analyzed data was saved to text files and processed using the JMP statistical analysis software (SAS institute).

Grain yield (gr.)—At the end of the experiment all spikes of the pots were collected. The total grains from all spikes that were manually threshed were weighted. The grain yield was calculated by per plot or per plant.

Spike length and width analysis—At the end of the experiment the length and width of five chosen spikes per plant were measured using measuring tape excluding the awns.

Spike number analysis—The spikes per plant were counted.

Plant height—Each of the plants was measured for its height using measuring tape. Height was measured from ground level to top of the longest spike excluding awns at two time points at the Vegetative growth (30 days after sowing) and at harvest.

Spike weight—The biomass and spikes weight of each plot was separated, measured and divided by the number of plants.

Dry weight=total weight of the vegetative portion above ground (excluding roots) after drying at 70° C. in oven for 48 hours at two time points at the Vegetative growth (30 days after sowing) and at harvest.

Spikelet per spike=number of spikelets per spike was counted.

Root/Shoot Ratio—The Root/Shoot Ratio is calculated using Formula XXII above.

Total No. of tillers—all tillers were counted per plot at two time points at the Vegetative growth (30 days after sowing) and at harvest.

Percent of reproductive tillers—the number of reproductive tillers barring a spike at harvest was divided by the total numbers of tillers.

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SPAD—Chlorophyll content was determined using a Minolta SPAD 502 chlorophyll meter and measurement was performed at time of flowering. SPAD meter readings were done on young fully developed leaf. Three measurements per leaf were taken per plot.

Root FW (gr.), root length (cm) and No. of lateral roots—3 plants per plot were selected for measurement of root weight, root length and for counting the number of lateral roots formed.

Shoot FW (fresh weight)—weight of 3 plants per plot were recorded at different time-points.

Average Grain Area (cm<sup>2</sup>)—At the end of the growing period the grains were separated from the spike. A sample of ~200 grains was weighted, photographed and images were processed using the below described image processing system. The grain area was measured from those images and was divided by the number of grains.

Average Grain Length and width (cm)—At the end of the growing period the grains were separated from the spike. A sample of ~200 grains was weighted, photographed and images were processed using the below described image processing system. The sum of grain lengths or width (longest axis) was measured from those images and was divided by the number of grains.

Average Grain perimeter (cm)—At the end of the growing period the grains were separated from the spike. A sample of ~200 grains was weighted, photographed and images were processed using the below described image processing system. The sum of grain perimeter was measured from those images and was divided by the number of grains.

Heading date—the day in which booting stage was observed was recorded and number of days from sowing to heading was calculated.

Relative water content—Fresh weight (FW) of three leaves from three plants each from different seed ID was immediately recorded; then leaves were soaked for 8 hours in distilled water at room temperature in the dark, and the turgid weight (TW) was recorded. Total dry weight (DW) was recorded after drying the leaves at 60° C. to a constant weight. Relative water content (RWC) is calculated according to Formula I above.

Harvest Index (for barley)—The harvest index was calculated using Formula XVIII above.

Relative growth rate: the relative growth rate (RGR) of Plant Height (Formula III above), SPAD (Formula IV above) and number of tillers (Formula V above) were calculated using the indicated formulas.

Ratio Drought/Normal: Represents ratio for the specified parameter of Drought condition results divided by Normal conditions results (maintenance of phenotype under drought in comparison to normal conditions).

TABLE 12

| Barley correlated parameters (vectors) under normal and low N conditions (at vegetative stage) |                |
|------------------------------------------------------------------------------------------------|----------------|
| Correlated parameter with                                                                      | Correlation ID |
| Lateral roots per plant at TP3 [number] Normal                                                 | 1              |
| Leaf Area [cm <sup>2</sup> ]                                                                   | 2              |
| Leaf Number-TP4-Low N [number]                                                                 | 3              |
| Leaf maximal length at TP4 [mm] Normal                                                         | 4              |
| Leaf maximal width at TP4 [mm] Normal                                                          | 5              |
| Leaf maximal length at TP4 [mm] Low N                                                          | 6              |
| Leaf maximal width at TP4 [mm] Low N                                                           | 7              |
| Lateral roots per plant at TP3 [number] Low N                                                  | 8              |
| No of tillers-Low N-TP2 [number]                                                               | 9              |

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TABLE 12-continued

| Barley correlated parameters (vectors) under normal and low N conditions (at vegetative stage) |                |
|------------------------------------------------------------------------------------------------|----------------|
| Correlated parameter with                                                                      | Correlation ID |
| Num Leaves[number]                                                                             | 10             |
| Num Seeds [number]                                                                             | 11             |
| Num Spikes [number]                                                                            | 12             |
| Num Tillers [number]                                                                           | 13             |
| Plant Height (cm)-Normal                                                                       | 14             |
| Plant Height (cm)-Low N                                                                        | 15             |
| Plant Height (cm)-Low N-TP2                                                                    | 16             |
| Root FW per plant at vegetative stage [gr.] Normal                                             | 17             |
| Root length per plant at vegetative stage [cm] Normal                                          | 18             |
| Root FW per plant at vegetative stage [gr.] Low N                                              | 19             |
| Root length per plant at vegetative stage [cm] Low N                                           | 20             |
| Chlorophyll level at vegetative stage [SPAD] Normal                                            | 21             |
| Chlorophyll level at vegetative stage [SPAD] Low N                                             | 22             |
| Seed Yield [gr.]                                                                               | 23             |
| Seed Number (per plot)-Low N [number]                                                          | 24             |
| Seed Yield (gr)-Low N                                                                          | 25             |
| Seed Yield (gr)-Normal                                                                         | 26             |
| Shoot FW per plant at vegetative stage [gr.] Normal                                            | 27             |
| Spike length [cm] Normal                                                                       | 28             |
| Spike width [mm] Normal                                                                        | 29             |
| Spike total weight (per plot)-normal [gr.]                                                     | 30             |
| Spike Length (cm)-Low N                                                                        | 31             |
| Spike Width (cm)-Low N                                                                         | 32             |
| Spike total weight (per plot)-Low N [gr.]                                                      | 33             |
| Total Tillers [number]                                                                         | 34             |
| Total Leaf Area (mm2)-TP4-Low N                                                                | 35             |
| Total No of Spikes per plot-Low N [number]                                                     | 36             |
| Total No of tillers per plot-Low N [number]                                                    | 37             |
| shoot FW (gr)-Low N-TP2                                                                        | 38             |

Table 12. Provided are the barley correlated parameters.

“TP” = time point;

“DW” = dry weight;

“FW” = fresh weight;

“Low N” = Low Nitrogen.

TABLE 13

| Barley correlated parameters (vectors) under normal and low N conditions (at reproductive stage) |                                           |
|--------------------------------------------------------------------------------------------------|-------------------------------------------|
| Correlation ID                                                                                   | Correlated parameter with                 |
| 1                                                                                                | Grain Perimeter [mm]                      |
| 2                                                                                                | Grain area [mm]                           |
| 3                                                                                                | Grain length [mm]                         |
| 4                                                                                                | Grain width [mm]                          |
| 5                                                                                                | Grains DW/Shoots DW                       |
| 6                                                                                                | Grains per plot [number]                  |
| 7                                                                                                | Grains weight per plant [gr.]             |
| 8                                                                                                | Grains weight per plot [gr.]              |
| 9                                                                                                | Plant Height [cm]                         |
| 10                                                                                               | Roots DW [gr.]                            |
| 11                                                                                               | Row number [number]                       |
| 12                                                                                               | Spikes FW (Harvest) [gr.]                 |
| 13                                                                                               | Spikes num [number]                       |
| 14                                                                                               | Tillering (Harvest) [number]              |
| 15                                                                                               | Vegetative DW (Harvest) [gr.]             |
| 16                                                                                               | percent of reproductive tillers [percent] |
| 17                                                                                               | shoot/root ratio                          |

Table 13. Provided are the barley correlated parameters under normal and low N conditions (at reproductive stage).

“TP” = time point;

“DW” = dry weight;

“FW” = fresh weight;

“Low N” = Low Nitrogen;

“Relative water content [percent] Ratio Drought/Normal” – maintenance of phenotype under drought in comparison to normal conditions

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TABLE 14

| Barley correlated parameters (vectors) under drought conditions (at vegetative stage) |                                                     |
|---------------------------------------------------------------------------------------|-----------------------------------------------------|
| Correlation ID                                                                        | Correlated parameter with                           |
| 1                                                                                     | Chlorophyll level vegetative stage [SPAD] Drought   |
| 2                                                                                     | Shoot DW at harvest [gr.]                           |
| 3                                                                                     | Shoot DW at harvest per plant [gr.] Drought         |
| 4                                                                                     | Shoot FW per plant at harvest [gr.] Drought         |
| 5                                                                                     | Grains per plant [number] Drought                   |
| 6                                                                                     | Grain yield per plant [gr.] Drought                 |
| 7                                                                                     | Harvest index                                       |
| 8                                                                                     | Heading date [days] Drought                         |
| 9                                                                                     | RGR by plant height Drought                         |
| 10                                                                                    | Number of tillers Relative growth rate              |
| 11                                                                                    | Plant height per plot at harvest [cm] Drought       |
| 12                                                                                    | RBH/BH                                              |
| 13                                                                                    | Relative water content vegetative [percent] Drought |
| 14                                                                                    | Root DW per plant vegetative stage [gr.] Drought    |
| 15                                                                                    | Root FW per plant vegetative stage [gr.] Drought    |
| 16                                                                                    | Root length per plant vegetative [cm] Drought       |
| 17                                                                                    | RGR by chlorophyll levels Drought                   |
| 18                                                                                    | Spike length [cm] Drought                           |
| 19                                                                                    | Spikes per plant [number] Drought                   |
| 20                                                                                    | Spikes yield per plant [gr.] Drought                |
| 21                                                                                    | Spike width [mm] Drought                            |
| 22                                                                                    | Tillers per plant at harvest [number] Drought       |
| 23                                                                                    | Lateral roots per plant vegetative [number] Drought |

Table 14. Provided are the barley correlated parameters under drought conditions (at vegetative stage). "RBH/BH" = root-shoot ratio

### Experimental Results

15 different Barley accessions were grown and characterized for different parameters as described above. Tables 12-14 describe the Barley correlated parameters. The average for each of the measured parameter was calculated using the JMP software and values are summarized in Tables 15-24 below. Subsequent correlation analysis between the various transcriptom sets and the average parameters was conducted. Follow, results were integrated to the database.

TABLE 15

| Measured parameters of correlation IDs in Barley accessions under low N conditions (at vegetative stage) |      |       |     |     |     |      |      |     |      |      |
|----------------------------------------------------------------------------------------------------------|------|-------|-----|-----|-----|------|------|-----|------|------|
| Corr. ID/Line                                                                                            | 3    | 6     | 7   | 8   | 9   | 15   | 16   | 19  | 20   | 22   |
| Line-1                                                                                                   | 8.0  | 102.9 | 5.3 | 5.0 | 0.0 | 41.0 | 16.3 | 0.4 | 24.7 | 24.0 |
| Line-2                                                                                                   | 8.0  | 107.8 | 5.2 | 6.0 | 0.0 | 82.0 | 18.8 | 0.2 | 21.7 | 23.3 |
| Line-3                                                                                                   | 7.5  | 111.6 | 5.1 | 4.3 | 0.0 | 61.4 | 17.3 | 0.1 | 22.0 | 26.5 |
| Line-4                                                                                                   | 8.5  | 142.4 | 5.3 | 6.0 | 0.0 | 59.4 | 26.0 | 0.4 | 21.7 | 23.9 |
| Line-5                                                                                                   | 10.0 | 152.4 | 5.2 | 6.3 | 0.0 | 65.8 | 22.5 | 0.9 | 22.2 | 26.6 |
| Line-6                                                                                                   | 11.5 | 149.3 | 5.3 | 6.0 | 0.0 | 47.8 | 18.2 | 0.5 | 23.0 | 23.2 |
| Line-7                                                                                                   | 8.6  | 124.1 | 5.3 | 6.7 | 0.0 | 53.8 | 19.7 | 0.4 | 30.5 | 25.4 |
| Line-8                                                                                                   | 6.3  | 95.0  | 5.1 | 4.7 | 0.0 | 56.4 | 19.8 | 0.3 | 22.8 | 24.2 |
| Line-9                                                                                                   | 7.5  | 124.1 | 5.2 | 5.7 | 0.0 | 81.8 | 19.2 | 0.3 | 23.8 | 25.0 |
| Line-10                                                                                                  | 10.0 | 135.2 | 5.1 | 7.3 | 0.0 | 44.6 | 19.2 | 0.6 | 24.5 | 26.1 |

Table 15: Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under low N conditions. Growth conditions are specified in the experimental procedure section.

TABLE 16

| Measured parameters of correlation IDs in additional Barley accessions under low N conditions (at vegetative stage) |       |     |      |      |     |      |      |      |      |     |
|---------------------------------------------------------------------------------------------------------------------|-------|-----|------|------|-----|------|------|------|------|-----|
| Corr. ID/Line                                                                                                       | 24    | 25  | 26   | 31   | 32  | 33   | 35   | 36   | 37   | 38  |
| Line-1                                                                                                              | 230.2 | 9.8 | 46.4 | 15.2 | 8.0 | 13.7 | 39.4 | 12.2 | 16.2 | 0.4 |
| Line-2                                                                                                              | 164.6 | 7.3 | 19.8 | 19.6 | 8.1 | 13.4 | 46.3 | 9.0  | 14.6 | 0.4 |

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TABLE 16-continued

| Measured parameters of correlation IDs in additional Barley accessions under low N conditions (at vegetative stage) |       |     |      |      |      |      |      |      |      |     |
|---------------------------------------------------------------------------------------------------------------------|-------|-----|------|------|------|------|------|------|------|-----|
| Corr. ID/Line                                                                                                       | 24    | 25  | 26   | 31   | 32   | 33   | 35   | 36   | 37   | 38  |
| Line-3                                                                                                              | 88.3  | 3.3 | 10.8 | 16.3 | 9.4  | 9.2  | 51.5 | 11.6 | 16.0 | 0.3 |
| Line-4                                                                                                              | 133.6 | 5.1 | 22.6 | 19.3 | 4.9  | 11.6 | 57.1 | 25.0 | 20.8 | 0.6 |
| Line-5                                                                                                              | 106.0 | 6.0 | 30.3 | 90.2 | 9.6  | 11.3 | 67.8 | 7.8  | 12.5 | 0.8 |
| Line-6                                                                                                              | 222.6 | 9.7 | 54.1 | 16.4 | 7.2  | 15.1 | 64.2 | 14.5 | 18.8 | 0.5 |
| Line-7                                                                                                              | 219.2 | 7.4 | 37.0 | 20.4 | 7.1  | 12.2 | 52.4 | 15.0 | 21.2 | 0.5 |
| Line-8                                                                                                              | 143.5 | 5.8 | 42.0 | 18.8 | 8.5  | 11.0 | 46.2 | 7.0  | 11.0 | 0.4 |
| Line-9                                                                                                              | 201.8 | 7.8 | 35.4 | 18.8 | 10.0 | 12.2 | 68.0 | 5.4  | 6.8  | 0.5 |
| Line-10                                                                                                             | 125.0 | 6.3 | 38.3 | 16.6 | 9.4  | 10.6 | 57.9 | 8.4  | 14.0 | 0.6 |

Table 16. Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under low N conditions. Growth conditions are specified in the experimental procedure section.

TABLE 17

| Measured parameters of correlation IDs Barley accessions under normal conditions (at vegetative stage) |      |       |       |     |      |        |      |     |      |      |
|--------------------------------------------------------------------------------------------------------|------|-------|-------|-----|------|--------|------|-----|------|------|
| Corr. ID/Line                                                                                          | 1    | 2     | 4     | 5   | 10   | 11     | 12   | 13  | 14   | 14   |
| Line-1                                                                                                 | 7.0  | 294.0 | 502.0 | 5.8 | 24.2 | 1090.0 | 41.5 | 2.0 | 64.7 | 64.7 |
| Line-2                                                                                                 | 8.7  | 199.0 | 348.0 | 5.5 | 18.2 | 510.0  | 32.0 | 2.0 | 84.0 | 84.0 |
| Line-3                                                                                                 | 8.3  | 273.0 | 499.0 | 5.8 | 22.7 | 242.0  | 36.0 | 1.0 | 67.4 | 67.4 |
| Line-4                                                                                                 | 9.7  | 276.0 | 594.0 | 6.0 | 25.5 | 582.0  | 71.4 | 2.3 | 82.0 | 82.0 |
| Line-5                                                                                                 | 10.7 | 313.0 | 535.0 | 4.6 | 23.2 | 621.0  | 34.2 | 2.3 | 72.0 | 72.0 |
| Line-6                                                                                                 | 9.7  | 309.0 | 551.0 | 5.3 | 28.3 | 1070.0 | 45.6 | 3.3 | 56.6 | 56.6 |
| Line-7                                                                                                 | 9.7  | 259.0 | 479.0 | 5.8 | 22.2 | 903.0  | 49.8 | 2.3 | 65.8 | 65.8 |
| Line-8                                                                                                 | 8.7  | 291.0 | 399.0 | 5.4 | 19.0 | 950.0  | 28.0 | 1.3 | 62.8 | 62.8 |
| Line-9                                                                                                 | 10.0 | 299.0 | 384.0 | 5.8 | 17.3 | 984.0  | 19.3 | 1.3 | 91.6 | 91.6 |
| Line-10                                                                                                | 9.7  | 296.0 | 470.0 | 6.0 | 22.0 | 768.0  | 38.0 | 1.7 | 66.2 | 66.2 |

Table 17: Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under normal conditions. Growth conditions are specified in the experimental procedure section.

TABLE 18

| Measured parameters of correlation IDs in additional Barley accessions under normal conditions (at vegetative stage) |      |       |       |       |       |       |       |       |       |  |
|----------------------------------------------------------------------------------------------------------------------|------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| Corr. ID/Line                                                                                                        | 17   | 18    | 21    | 23    | 27    | 28    | 29    | 30    | 34    |  |
| Line-1                                                                                                               | 0.27 | 21.30 | 39.10 | 46.40 | 2.17  | 16.50 | 9.54  | 69.40 | 46.70 |  |
| Line-2                                                                                                               | 0.27 | 15.00 | 41.40 | 19.80 | 1.90  | 19.20 | 9.05  | 39.40 | 41.60 |  |
| Line-3                                                                                                               | 0.25 | 21.80 | 35.20 | 10.80 | 1.25  | 18.30 | 8.25  | 34.90 | 40.00 |  |
| Line-4                                                                                                               | 0.35 | 20.30 | 33.70 | 22.60 | 3.00  | 20.40 | 6.55  | 50.30 | 48.80 |  |
| Line-5                                                                                                               | 0.62 | 27.20 | 34.20 | 30.30 | 15.60 | 17.20 | 10.50 | 60.80 | 34.60 |  |
| Line-6                                                                                                               | 0.27 | 16.00 | 42.80 | 54.10 | 3.02  | 19.10 | 8.83  | 79.10 | 48.60 |  |
| Line-7                                                                                                               | 0.35 | 24.00 | 37.00 | 37.00 | 2.58  | 20.30 | 7.38  | 62.70 | 49.20 |  |
| Line-8                                                                                                               | 0.32 | 13.50 | 36.90 | 42.00 | 1.75  | 21.70 | 10.40 | 60.00 | 29.00 |  |
| Line-9                                                                                                               | 0.23 | 21.50 | 35.00 | 35.40 | 2.18  | 16.50 | 10.20 | 55.90 | 27.50 |  |
| Line-10                                                                                                              | 0.27 | 15.20 | 36.80 | 38.30 | 1.82  | 16.10 | 10.30 | 59.70 | 38.80 |  |

Table 18. Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under normal conditions. Growth conditions are specified in the experimental procedure section.

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TABLE 19

| Measured parameters of correlation IDs in Barley accessions under low N conditions (at reproductive stage) |      |      |      |      |      |         |       |       |       |
|------------------------------------------------------------------------------------------------------------|------|------|------|------|------|---------|-------|-------|-------|
| Corr. ID/<br>Line                                                                                          | 1    | 2    | 3    | 4    | 5    | 6       | 7     | 8     | 9     |
| Line-1                                                                                                     | 2.24 | 0.25 | 0.89 | 0.35 | 0.40 | 683.40  | 6.65  | 33.24 | 76.40 |
| Line-2                                                                                                     | 2.24 | 0.24 | 0.87 | 0.35 | 0.16 | 510.50  | 3.96  | 19.81 | 84.00 |
| Line-3                                                                                                     | 2.18 | 0.24 | 0.86 | 0.35 | 1.01 | 1093.50 | 9.27  | 46.37 | 64.67 |
| Line-4                                                                                                     | 2.05 | 0.23 | 0.80 | 0.37 | 0.79 | 767.60  | 7.65  | 38.25 | 66.20 |
| Line-5                                                                                                     | 2.08 | 0.24 | 0.83 | 0.37 | 0.41 | 621.00  | 6.06  | 30.30 | 72.00 |
| Line-6                                                                                                     | 2.03 | 0.25 | 0.78 | 0.41 | 0.99 | 1069.00 | 10.83 | 54.13 | 56.60 |
| Line-7                                                                                                     | 2.25 | 0.24 | 0.90 | 0.35 | 0.67 | 987.75  | 7.94  | 39.69 | 68.00 |
| Line-8                                                                                                     | 1.88 | 0.22 | 0.72 | 0.39 | 0.61 | 903.20  | 7.40  | 36.98 | 65.80 |
| Line-9                                                                                                     | 2.09 | 0.23 | 0.82 | 0.36 | 0.28 | 581.80  | 4.52  | 22.58 | 82.00 |
| Line-10                                                                                                    | 2.03 | 0.22 | 0.79 | 0.36 | 1.04 | 904.40  | 8.41  | 39.68 | 62.80 |
| Line-11                                                                                                    | 2.02 | 0.24 | 0.80 | 0.37 | 0.12 | 242.40  | 2.00  | 10.84 | 67.40 |
| Line-12                                                                                                    | 1.98 | 0.21 | 0.80 | 0.34 | 0.86 | 928.40  | 8.05  | 40.26 | 76.20 |
| Line-13                                                                                                    | 1.69 | 0.18 | 0.65 | 0.35 | 0.58 | 984.20  | 7.08  | 35.37 | 91.60 |
| Line-14                                                                                                    | 1.98 | 0.19 | 0.82 | 0.29 | 0.05 | 157.67  | 0.75  | 3.73  | 44.00 |
| Line-15                                                                                                    | 1.89 | 0.17 | 0.77 | 0.29 | 0.08 | 263.25  | 1.14  | 5.68  | 52.75 |

Table 19: Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under low N conditions (at reproductive stage). Growth conditions are specified in the experimental procedure section.

TABLE 20

| Measured parameters of correlation IDs in additional Barley accessions under low N conditions (at reproductive stage) |        |      |       |       |       |       |       |      |
|-----------------------------------------------------------------------------------------------------------------------|--------|------|-------|-------|-------|-------|-------|------|
| Corr. ID/<br>Line                                                                                                     | 10     | 11   | 12    | 13    | 14    | 15    | 16    | 17   |
| Line-1                                                                                                                | 118.30 | 6.00 | 69.84 | 38.60 | 44.25 | 89.20 | 82.30 | 1.48 |
| Line-2                                                                                                                | 150.68 | 6.00 | 39.86 | 32.00 | 41.60 | 99.65 | 77.75 | 0.64 |
| Line-3                                                                                                                | 86.28  | 6.00 | 69.40 | 41.50 | 46.67 | 45.79 | 86.69 | 0.84 |
| Line-4                                                                                                                | 85.19  | 6.00 | 59.72 | 38.00 | 38.80 | 49.39 | 94.23 | 0.82 |
| Line-5                                                                                                                | 120.31 | 6.00 | 60.83 | 34.20 | 34.60 | 74.32 | 89.74 | 1.15 |
| Line-6                                                                                                                | 90.70  | 2.80 | 79.12 | 45.60 | 48.60 | 55.11 | 93.73 | 0.69 |
| Line-7                                                                                                                | 40.58  | 6.00 | 63.50 | 30.00 | 32.40 | 47.29 | 89.49 | 1.26 |
| Line-8                                                                                                                | 90.51  | 2.00 | 62.74 | 49.80 | 55.20 | 60.32 | 90.28 | 0.72 |
| Line-9                                                                                                                | 92.59  | 2.00 | 50.30 | 71.40 | 50.60 | 88.01 | 91.21 | 1.17 |
| Line-10                                                                                                               | 63.95  | 5.20 | 59.95 | 28.00 | 29.00 | 38.89 | 92.50 | 0.71 |
| Line-11                                                                                                               | 286.63 | 6.00 | 34.92 | 36.00 | 40.00 | 97.71 | 91.73 | 0.38 |
| Line-12                                                                                                               | 95.79  | 6.00 | 60.08 | 27.60 | 28.50 | 48.33 | 85.31 | 0.51 |
| Line-13                                                                                                               | 34.04  | 6.00 | 55.88 | 23.60 | 27.50 | 62.52 |       | 2.16 |
| Line-14                                                                                                               | 121.27 | 4.67 | 16.93 | 54.67 | 26.00 | 57.97 |       | 0.67 |
| Line-15                                                                                                               | 206.75 | 4.00 | 21.70 | 48.00 |       | 72.78 |       | 0.40 |

Table 20: Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under low N conditions (at reproductive stage). Growth conditions are specified in the experimental procedure section.

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TABLE 21

| Measured parameters of correlation IDs Barley accessions under accessions under normal conditions (at reproductive stage) |      |      |      |      |      |        |      |      |       |
|---------------------------------------------------------------------------------------------------------------------------|------|------|------|------|------|--------|------|------|-------|
| Corr. ID/<br>Line                                                                                                         | 1    | 2    | 3    | 4    | 5    | 6      | 7    | 8    | 9     |
| Line-1                                                                                                                    | 2.29 | 0.25 | 0.90 | 0.35 | 0.39 | 153.20 | 1.34 | 6.68 | 75.20 |
| Line-2                                                                                                                    | 2.33 | 0.25 | 0.92 | 0.35 | 0.42 | 164.60 | 1.46 | 7.31 | 82.00 |
| Line-3                                                                                                                    | 2.28 | 0.26 | 0.93 | 0.35 | 1.25 | 230.20 | 1.95 | 9.76 | 41.00 |
| Line-4                                                                                                                    | 2.08 | 0.24 | 0.82 | 0.36 | 0.69 | 125.00 | 1.26 | 6.29 | 44.60 |
| Line-5                                                                                                                    | 2.13 | 0.25 | 0.86 | 0.37 | 0.43 | 100.00 | 1.13 | 5.67 | 65.80 |
| Line-6                                                                                                                    | 1.96 | 0.23 | 0.76 | 0.38 | 0.87 | 222.60 | 1.95 | 9.74 | 47.80 |
| Line-7                                                                                                                    | 2.09 | 0.23 | 0.83 | 0.35 | 0.77 | 159.40 | 1.28 | 6.40 | 60.60 |
| Line-8                                                                                                                    | 1.88 | 0.21 | 0.74 | 0.36 | 0.53 | 219.20 | 1.47 | 7.35 | 53.80 |
| Line-9                                                                                                                    | 2.19 | 0.24 | 0.86 | 0.35 | 0.34 | 133.60 | 0.98 | 5.06 | 59.40 |
| Line-10                                                                                                                   | 1.88 | 0.20 | 0.73 | 0.35 | 0.87 | 134.40 | 1.16 | 5.43 | 56.40 |
| Line-11                                                                                                                   | 2.03 | 0.22 | 0.81 | 0.35 | 0.15 | 88.25  | 0.92 | 4.62 | 61.40 |
| Line-12                                                                                                                   | 2.11 | 0.23 | 0.85 | 0.35 | 0.58 | 174.25 | 1.34 | 6.67 | 65.60 |
| Line-13                                                                                                                   | 1.77 | 0.19 | 0.68 | 0.36 | 0.76 | 201.80 | 1.57 | 7.83 | 81.80 |
| Line-14                                                                                                                   | 2.00 | 0.19 | 0.81 | 0.30 | 0.05 | 86.67  | 0.29 | 1.44 | 69.00 |
| Line-15                                                                                                                   | 1.90 | 0.17 | 0.79 | 0.28 | 0.07 | 61.60  | 0.22 | 1.12 | 57.40 |

Table 21: Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under normal conditions (at reproductive stage). Growth conditions are specified in the experimental procedure section.

TABLE 22

| Measured parameters of correlation IDs in additional Barley accessions under accessions under normal conditions (at reproductive stage) |       |      |       |       |       |       |       |      |
|-----------------------------------------------------------------------------------------------------------------------------------------|-------|------|-------|-------|-------|-------|-------|------|
| Corr. ID/<br>Line                                                                                                                       | 10    | 11   | 12    | 13    | 14    | 15    | 16    | 17   |
| Line-1                                                                                                                                  | 39.91 | 6.00 | 11.40 | 10.80 | 16.00 | 17.42 | 68.69 | 0.69 |
| Line-2                                                                                                                                  | 26.24 | 6.00 | 13.44 | 9.00  | 14.60 | 17.76 | 61.85 | 1.08 |
| Line-3                                                                                                                                  | 17.31 | 6.00 | 13.74 | 12.20 | 16.20 | 8.25  | 76.94 | 0.77 |
| Line-4                                                                                                                                  | 32.91 | 6.00 | 10.62 | 8.40  | 14.00 | 7.28  | 59.63 | 0.38 |
| Line-5                                                                                                                                  | 33.87 | 6.00 | 11.34 | 7.80  | 12.50 | 13.25 | 65.63 | 0.83 |
| Line-6                                                                                                                                  | 83.84 | 2.00 | 15.06 | 14.50 | 18.80 | 11.32 | 79.84 | 0.42 |
| Line-7                                                                                                                                  | 29.65 | 6.00 | 11.64 | 8.40  | 11.60 | 8.95  | 73.85 | 0.29 |
| Line-8                                                                                                                                  | 37.21 | 2.00 | 12.18 | 15.00 | 21.20 | 14.18 | 71.01 | 0.57 |
| Line-9                                                                                                                                  | 44.38 | 2.00 | 11.64 | 25.00 | 23.50 | 15.68 | 95.83 | 0.60 |
| Line-10                                                                                                                                 | 14.46 | 5.20 | 8.76  | 7.00  | 11.00 | 6.42  | 64.87 | 0.55 |
| Line-11                                                                                                                                 | 41.54 | 6.00 | 9.15  | 11.60 | 16.00 | 55.92 | 68.75 | 2.88 |
| Line-12                                                                                                                                 | 23.75 | 6.00 | 12.42 | 7.60  | 10.75 | 11.54 | 74.24 | 1.36 |
| Line-13                                                                                                                                 | 20.87 | 6.00 | 12.18 | 5.40  | 6.75  | 10.88 | 81.40 | 0.89 |
| Line-14                                                                                                                                 | 49.69 | 2.00 | 5.68  | 16.40 | 35.00 | 58.92 | 37.14 | 2.49 |
| Line-15                                                                                                                                 | 54.02 | 2.00 | 5.04  | 12.00 |       | 17.05 |       | 0.40 |

Table 22: Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under normal conditions (at reproductive stage). Growth conditions are specified in the experimental procedure section.

TABLE 23

| Additional measured parameters of correlation IDs in Barley accessions under Drought conditions |       |      |      |      |        |       |      |       |      |      |       |
|-------------------------------------------------------------------------------------------------|-------|------|------|------|--------|-------|------|-------|------|------|-------|
| Corr. ID/<br>Line                                                                               | 1     | 2    | 3    | 4    | 5      | 6     | 7    | 8     | 9    | 10   | 11    |
| Line-1                                                                                          | 41.33 | 6.15 | 0.22 | 1.90 | 170.00 | 5.55  | 0.47 | 75.00 | 0.27 | 0.07 | 46.00 |
| Line-2                                                                                          | 33.57 | 5.05 | 0.21 | 1.52 | 267.50 | 9.80  | 0.66 | 71.00 | 0.86 | 0.10 | 52.86 |
| Line-3                                                                                          | 36.57 | 3.20 |      | 1.17 | 111.00 | 3.55  | 0.53 | 65.00 | 0.73 | 0.06 | 35.00 |
| Line-4                                                                                          | 40.50 | 3.28 |      | 1.95 | 205.33 | 7.20  | 0.69 |       | 0.88 | 0.07 | 38.00 |
| Line-5                                                                                          | 45.07 | 4.76 |      | 1.90 | 153.60 | 5.28  | 0.53 | 66.75 | 0.40 | 0.16 | 45.20 |
| Line-6                                                                                          | 39.73 | 3.55 | 0.17 | 1.22 | 252.50 | 7.75  | 0.69 | 90.00 | 0.94 | 0.06 | 48.00 |
| Line-7                                                                                          | 38.33 | 4.52 |      | 1.75 | 288.40 | 9.92  | 0.69 | 90.00 | 0.70 | 0.10 | 37.67 |
| Line-8                                                                                          | 36.17 | 3.38 |      | 1.58 | 274.50 | 10.25 | 0.75 |       | 0.71 | 0.05 | 41.20 |
| Line-9                                                                                          | 42.13 | 5.67 | 0.25 | 1.88 | 348.50 | 8.50  | 0.60 | 90.00 | 0.77 | 0.10 | 40.80 |
| Line-10                                                                                         | 31.77 | 3.31 |      | 1.73 | 358.00 | 14.03 | 0.81 |       | 0.80 | 0.06 | 49.86 |
| Line-11                                                                                         | 33.47 | 2.65 |      | 1.00 | 521.39 | 17.52 | 0.87 |       | 0.92 | 0.06 | 43.00 |
| Line-12                                                                                         | 42.37 | 5.12 | 0.13 | 0.90 | 71.50  | 2.05  | 0.29 | 90.00 | 0.39 | 0.18 | 47.40 |
| Line-13                                                                                         | 42.27 | 6.86 | 0.19 | 0.90 | 160.13 | 5.38  | 0.44 | 81.60 | 0.88 | 0.15 | 64.80 |

TABLE 23-continued

| Additional measured parameters of correlation IDs in Barley accessions under Drought conditions |       |      |      |      |        |       |      |       |       |      |       |
|-------------------------------------------------------------------------------------------------|-------|------|------|------|--------|-------|------|-------|-------|------|-------|
| Corr.<br>ID/<br>Line                                                                            | 1     | 2    | 3    | 4    | 5      | 6     | 7    | 8     | 9     | 10   | 11    |
| Line-14                                                                                         | 36.77 | 3.11 | 0.22 | 1.43 | 376.67 | 11.00 | 0.78 | 90.00 | -0.13 | 0.02 | 52.60 |
| Line-15                                                                                         | 40.63 | 3.74 |      | 0.83 | 105.00 | 2.56  | 0.41 |       | 0.20  | 0.44 | 32.00 |

Table 23: Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under drought growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 24

| Additional measured parameters of correlation IDs in additional Barley accessions under Drought conditions |      |       |        |      |       |       |       |      |       |      |       |       |      |
|------------------------------------------------------------------------------------------------------------|------|-------|--------|------|-------|-------|-------|------|-------|------|-------|-------|------|
| Corr.<br>ID/<br>Line                                                                                       | 12   | 13    | 14     | 15   | 16    | 17    | 18    | 19   | 20    | 21   | 22    | 22    | 23   |
| Line-1                                                                                                     | 0.01 | 80.60 | 77.52  | 2.07 | 21.67 | 0.09  | 16.70 | 4.20 | 17.72 | 8.64 | 11.68 | 11.68 | 8.33 |
| Line-2                                                                                                     | 0.01 | 53.40 | 60.19  | 1.48 | 20.33 | -0.12 | 16.85 | 4.36 | 24.24 | 9.07 | 9.04  | 9.04  | 8.67 |
| Line-3                                                                                                     | 0.01 | 55.87 | 27.13  | 1.12 | 22.00 | 0.00  | 13.27 | 7.60 | 18.20 | 7.83 | 10.92 | 10.92 | 7.33 |
| Line-4                                                                                                     | 0.01 |       | 18.62  | 1.87 | 24.00 | 0.01  | 13.55 | 8.44 | 18.00 | 7.32 | 10.16 | 10.16 | 7.67 |
| Line-5                                                                                                     | 0.03 | 43.22 | 117.42 | 1.67 | 20.67 | 0.04  | 14.19 | 4.92 | 19.50 | 8.74 | 10.32 | 10.32 | 6.67 |
| Line-6                                                                                                     | 0.02 | 69.78 | 70.72  | 1.68 | 18.33 | -0.07 | 15.64 | 3.43 | 15.00 | 7.62 | 8.78  | 8.78  | 6.67 |
| Line-7                                                                                                     | 0.01 | 45.49 | 37.34  | 1.62 | 21.00 | 0.01  | 15.66 | 6.90 | 23.40 | 6.98 | 13.00 | 13.00 | 7.67 |
| Line-8                                                                                                     | 0.01 | 76.51 | 25.56  | 0.85 | 20.33 | 0.00  | 17.49 | 5.80 | 28.16 | 8.05 | 7.44  | 7.44  | 6.67 |
| Line-9                                                                                                     | 0.01 | 87.41 | 66.18  | 1.45 | 21.67 | -0.06 | 16.00 | 8.55 | 21.96 | 6.06 | 13.92 | 13.92 | 6.00 |
| Line-10                                                                                                    | 0.01 |       | 22.13  | 1.38 | 19.67 | 0.04  | 18.31 | 9.67 | 33.03 | 6.73 | 11.00 | 11.00 | 8.67 |
| Line-11                                                                                                    | 0.02 |       | 41.12  | 0.82 | 16.67 | 0.05  | 17.42 | 5.42 | 34.80 | 9.55 | 6.78  | 6.78  | 7.67 |
| Line-12                                                                                                    | 0.02 | 58.32 | 116.95 | 0.58 | 17.00 | 0.00  | 14.23 | 3.05 | 11.73 | 7.84 | 8.45  | 8.45  | 6.33 |
| Line-13                                                                                                    | 0.01 | 80.58 | 84.10  | 0.63 | 15.17 | -0.07 | 14.81 | 4.07 | 18.78 | 7.81 | 9.15  | 9.15  | 7.00 |
| Line-14                                                                                                    | 0.01 | 73.09 | 37.46  | 1.07 | 27.00 | 0.03  | 16.54 | 3.72 | 21.00 | 8.35 | 5.12  | 5.12  | 7.00 |
| Line-15                                                                                                    | 0.03 |       | 98.86  | 0.70 | 15.00 | -0.06 | 12.72 | 3.21 | 9.88  | 5.47 | 16.13 | 16.13 | 6.67 |

Table 24: Provided are the values of each of the parameters (as described above) measured in Barley accessions (line) under drought growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 25

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under low nitrogen and normal conditions (at vegetative stage) across Barley accessions |      |          |          |             |           |      |          |          |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|----------|-------------|-----------|------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                                                                 | R    | P value  | Esp. set | Cor. Set ID | Gene Name | R    | P value  | Exp. set | Cor. Set ID |
| LNU749                                                                                                                                                                                                                                    | 0.76 | 1.75E-02 | 1        | 15          | LNU750    | 0.73 | 2.45E-02 | 2        | 27          |
| LNU750                                                                                                                                                                                                                                    | 0.77 | 1.54E-02 | 2        | 17          | LNU750    | 0.87 | 2.60E-03 | 3        | 35          |
| LNU751                                                                                                                                                                                                                                    | 0.89 | 1.30E-03 | 1        | 15          | LNU751    | 0.98 | 2.69E-06 | 2        | 27          |
| LNU751                                                                                                                                                                                                                                    | 0.93 | 2.74E-04 | 2        | 17          | LNU751    | 0.76 | 1.76E-02 | 3        | 15          |
| LNU752                                                                                                                                                                                                                                    | 0.72 | 2.74E-02 | 1        | 15          | LNU752    | 0.92 | 5.34E-04 | 2        | 27          |
| LNU752                                                                                                                                                                                                                                    | 0.86 | 2.91E-03 | 2        | 17          | LNU753    | 0.84 | 4.60E-03 | 3        | 31          |
| LNU753                                                                                                                                                                                                                                    | 0.74 | 2.15E-02 | 3        | 19          | LNU754    | 0.85 | 3.73E-03 | 1        | 19          |
| LNU754                                                                                                                                                                                                                                    | 0.78 | 1.29E-02 | 1        | 38          | LNU754    | 0.84 | 5.09E-03 | 2        | 21          |
| LNU754                                                                                                                                                                                                                                    | 0.71 | 3.26E-02 | 3        | 31          | LNU754    | 0.86 | 3.31E-03 | 3        | 19          |
| LNU754                                                                                                                                                                                                                                    | 0.80 | 8.98E-03 | 3        | 3           | LNU754    | 0.86 | 3.10E-03 | 3        | 38          |
| LNU756                                                                                                                                                                                                                                    | 0.94 | 4.00E-04 | 4        | 18          | LNU756    | 0.72 | 4.47E-02 | 4        | 27          |
| LNU756                                                                                                                                                                                                                                    | 0.74 | 3.76E-02 | 4        | 17          | LNU756    | 0.70 | 2.33E-02 | 5        | 35          |
| LNU756                                                                                                                                                                                                                                    | 0.87 | 9.76E-04 | 5        | 8           | LNU756    | 0.70 | 2.33E-02 | 5        | 38          |
| LNU756                                                                                                                                                                                                                                    | 0.74 | 1.40E-02 | 5        | 6           | LNU756    | 0.78 | 1.34E-02 | 3        | 31          |
| LNU756                                                                                                                                                                                                                                    | 0.72 | 2.94E-02 | 3        | 38          | LNU757    | 0.70 | 5.28E-02 | 6        | 28          |
| LNU757                                                                                                                                                                                                                                    | 0.77 | 9.44E-03 | 5        | 6           | LNU757    | 0.88 | 1.66E-03 | 3        | 20          |
| LNU758                                                                                                                                                                                                                                    | 0.79 | 2.06E-02 | 4        | 14          | LNU758    | 0.86 | 1.27E-03 | 5        | 20          |
| LNU758                                                                                                                                                                                                                                    | 0.77 | 1.60E-02 | 3        | 24          | LNU759    | 0.80 | 8.91E-03 | 3        | 3           |
| LNU759                                                                                                                                                                                                                                    | 0.72 | 2.87E-02 | 3        | 8           | LNU760    | 0.73 | 3.85E-02 | 4        | 18          |
| LNU760                                                                                                                                                                                                                                    | 0.74 | 2.15E-02 | 3        | 19          | LNU760    | 0.79 | 1.07E-02 | 3        | 3           |
| LNU760                                                                                                                                                                                                                                    | 0.85 | 4.06E-03 | 3        | 22          | LNU760    | 0.73 | 2.57E-02 | 3        | 38          |
| LNU760                                                                                                                                                                                                                                    | 0.70 | 3.50E-02 | 3        | 6           | LNU761    | 0.73 | 4.00E-02 | 6        | 10          |
| LNU761                                                                                                                                                                                                                                    | 0.81 | 1.47E-02 | 6        | 27          | LNU761    | 0.90 | 2.64E-03 | 6        | 13          |
| LNU761                                                                                                                                                                                                                                    | 0.74 | 2.34E-02 | 1        | 15          | LNU761    | 0.83 | 1.07E-02 | 4        | 14          |
| LNU761                                                                                                                                                                                                                                    | 0.83 | 6.15E-03 | 2        | 27          | LNU761    | 0.76 | 1.68E-02 | 2        | 17          |
| LNU761                                                                                                                                                                                                                                    | 0.86 | 3.06E-03 | 3        | 31          | LNU761    | 0.73 | 2.49E-02 | 3        | 19          |
| LNU762                                                                                                                                                                                                                                    | 0.71 | 4.71E-02 | 6        | 27          | LNU762    | 0.84 | 9.31E-03 | 6        | 13          |

TABLE 25-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under low nitrogen and normal conditions (at vegetative stage) across Barley accessions |      |          |          |             |           |      |          |          |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|----------|-------------|-----------|------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                                                                 | R    | P value  | Esp. set | Cor. Set ID | Gene Name | R    | P value  | Exp. set | Cor. Set ID |
| LNU762                                                                                                                                                                                                                                    | 0.84 | 4.92E-03 | 1        | 7           | LNU762    | 0.76 | 1.68E-02 | 1        | 37          |
| LNU763                                                                                                                                                                                                                                    | 0.81 | 1.58E-02 | 6        | 5           | LNU763    | 0.73 | 2.70E-02 | 2        | 18          |
| LNU763                                                                                                                                                                                                                                    | 0.74 | 2.30E-02 | 2        | 27          | LNU763    | 0.74 | 2.25E-02 | 2        | 17          |
| LNU764                                                                                                                                                                                                                                    | 0.73 | 3.83E-02 | 4        | 18          | LNU764    | 0.77 | 9.51E-03 | 5        | 26          |
| LNU764                                                                                                                                                                                                                                    | 0.77 | 8.83E-03 | 5        | 7           | LNU764    | 0.75 | 1.26E-02 | 5        | 25          |
| LNU764                                                                                                                                                                                                                                    | 0.74 | 1.50E-02 | 5        | 33          | LNU764    | 0.76 | 1.85E-02 | 3        | 7           |
| LNU764                                                                                                                                                                                                                                    | 0.76 | 1.68E-02 | 3        | 36          | LNU764    | 0.80 | 9.88E-03 | 3        | 16          |
| LNU766                                                                                                                                                                                                                                    | 0.71 | 4.88E-02 | 6        | 27          | LNU766    | 0.77 | 2.65E-02 | 6        | 13          |
| LNU766                                                                                                                                                                                                                                    | 0.71 | 3.21E-02 | 1        | 8           | LNU766    | 0.87 | 2.11E-03 | 1        | 20          |
| LNU766                                                                                                                                                                                                                                    | 0.73 | 4.02E-02 | 4        | 14          | LNU766    | 0.78 | 7.63E-03 | 5        | 19          |
| LNU766                                                                                                                                                                                                                                    | 0.83 | 2.85E-03 | 5        | 3           | LNU766    | 0.77 | 9.25E-03 | 5        | 8           |
| LNU766                                                                                                                                                                                                                                    | 0.83 | 6.19E-03 | 2        | 21          | LNU766    | 0.71 | 3.08E-02 | 3        | 15          |
| LNU767                                                                                                                                                                                                                                    | 0.76 | 1.02E-02 | 5        | 31          | LNU767    | 0.77 | 1.54E-02 | 3        | 31          |
| LNU768                                                                                                                                                                                                                                    | 0.84 | 8.81E-03 | 6        | 13          | LNU768    | 0.77 | 1.43E-02 | 1        | 35          |
| LNU768                                                                                                                                                                                                                                    | 0.72 | 2.93E-02 | 1        | 6           | LNU768    | 0.74 | 3.42E-02 | 4        | 10          |
| LNU768                                                                                                                                                                                                                                    | 0.85 | 3.32E-03 | 3        | 31          | LNU769    | 0.74 | 2.19E-02 | 1        | 24          |
| LNU769                                                                                                                                                                                                                                    | 0.77 | 9.46E-03 | 5        | 20          | LNU769    | 0.72 | 2.94E-02 | 2        | 11          |
| LNU770                                                                                                                                                                                                                                    | 0.79 | 6.40E-03 | 5        | 19          | LNU770    | 0.77 | 9.80E-03 | 5        | 35          |
| LNU770                                                                                                                                                                                                                                    | 0.94 | 4.58E-05 | 5        | 38          | LNU770    | 0.81 | 4.44E-03 | 5        | 6           |
| LNU770                                                                                                                                                                                                                                    | 0.73 | 2.54E-02 | 3        | 19          | LNU770    | 0.78 | 1.29E-02 | 3        | 3           |
| LNU770                                                                                                                                                                                                                                    | 0.83 | 6.19E-03 | 3        | 38          | LNU770    | 0.72 | 2.94E-02 | 3        | 6           |
| LNU771                                                                                                                                                                                                                                    | 0.74 | 3.66E-02 | 4        | 10          | LNU771    | 0.90 | 2.59E-03 | 4        | 18          |
| LNU771                                                                                                                                                                                                                                    | 0.76 | 1.64E-02 | 2        | 29          | LNU772    | 0.72 | 4.44E-02 | 6        | 5           |
| LNU772                                                                                                                                                                                                                                    | 0.73 | 4.12E-02 | 4        | 34          | LNU772    | 0.70 | 5.24E-02 | 4        | 18          |
| LNU772                                                                                                                                                                                                                                    | 0.77 | 1.60E-02 | 2        | 18          | LNU773    | 0.78 | 2.35E-02 | 6        | 12          |
| LNU773                                                                                                                                                                                                                                    | 0.75 | 3.21E-02 | 6        | 27          | LNU773    | 0.72 | 3.00E-02 | 1        | 20          |
| LNU773                                                                                                                                                                                                                                    | 0.88 | 7.99E-04 | 5        | 8           | LNU773    | 0.82 | 7.06E-03 | 3        | 31          |
| LNU773                                                                                                                                                                                                                                    | 0.93 | 3.04E-04 | 3        | 19          | LNU773    | 0.84 | 4.98E-03 | 3        | 3           |
| LNU773                                                                                                                                                                                                                                    | 0.94 | 2.08E-04 | 3        | 38          | LNU773    | 0.82 | 6.35E-03 | 3        | 6           |
| LNU774                                                                                                                                                                                                                                    | 0.92 | 1.27E-03 | 6        | 5           | LNU774    | 0.83 | 5.80E-03 | 1        | 31          |
| LNU774                                                                                                                                                                                                                                    | 0.73 | 2.53E-02 | 1        | 19          | LNU774    | 0.75 | 1.97E-02 | 1        | 38          |
| LNU774                                                                                                                                                                                                                                    | 0.73 | 3.92E-02 | 4        | 1           | LNU774    | 0.80 | 1.80E-02 | 4        | 27          |
| LNU774                                                                                                                                                                                                                                    | 0.80 | 1.70E-02 | 4        | 17          | LNU774    | 0.84 | 4.74E-03 | 2        | 18          |
| LNU774                                                                                                                                                                                                                                    | 0.85 | 3.61E-03 | 2        | 27          | LNU774    | 0.86 | 2.84E-03 | 2        | 17          |
| LNU774                                                                                                                                                                                                                                    | 0.93 | 3.07E-04 | 3        | 31          | LNU774    | 0.84 | 5.09E-03 | 3        | 19          |
| LNU774                                                                                                                                                                                                                                    | 0.74 | 2.28E-02 | 3        | 35          | LNU774    | 0.89 | 1.46E-03 | 3        | 38          |
| LNU774                                                                                                                                                                                                                                    | 0.77 | 1.45E-02 | 3        | 6           | LNU775    | 0.72 | 4.43E-02 | 6        | 21          |
| LNU775                                                                                                                                                                                                                                    | 0.73 | 4.07E-02 | 6        | 27          | LNU775    | 0.76 | 2.95E-02 | 6        | 13          |
| LNU775                                                                                                                                                                                                                                    | 0.70 | 3.53E-02 | 1        | 24          | LNU775    | 0.73 | 3.80E-02 | 4        | 2           |
| LNU775                                                                                                                                                                                                                                    | 0.78 | 1.28E-02 | 3        | 31          | LNU775    | 0.71 | 3.36E-02 | 3        | 38          |
| LNU776                                                                                                                                                                                                                                    | 0.82 | 1.33E-02 | 4        | 28          | LNU776    | 0.89 | 2.89E-03 | 4        | 13          |
| LNU776                                                                                                                                                                                                                                    | 0.80 | 9.89E-03 | 3        | 31          | LNU776    | 0.73 | 2.67E-02 | 3        | 19          |
| LNU776                                                                                                                                                                                                                                    | 0.79 | 1.15E-02 | 3        | 35          | LNU776    | 0.83 | 5.87E-03 | 3        | 38          |
| LNU776                                                                                                                                                                                                                                    | 0.88 | 1.76E-03 | 3        | 6           | LNU776    | 0.79 | 1.14E-02 | 3        | 16          |
| LNU777                                                                                                                                                                                                                                    | 0.94 | 4.33E-04 | 6        | 17          | LNU777    | 0.87 | 2.53E-03 | 1        | 19          |
| LNU777                                                                                                                                                                                                                                    | 0.96 | 4.74E-05 | 1        | 38          | LNU777    | 0.79 | 1.16E-02 | 1        | 6           |
| LNU777                                                                                                                                                                                                                                    | 0.83 | 5.49E-03 | 3        | 31          | LNU777    | 0.86 | 3.12E-03 | 3        | 19          |
| LNU777                                                                                                                                                                                                                                    | 0.80 | 9.73E-03 | 3        | 38          | LNU778    | 0.79 | 1.94E-02 | 6        | 13          |
| LNU778                                                                                                                                                                                                                                    | 0.87 | 4.98E-03 | 6        | 14          | LNU778    | 0.73 | 1.74E-02 | 5        | 25          |
| LNU778                                                                                                                                                                                                                                    | 0.70 | 2.30E-02 | 5        | 33          | LNU778    | 0.82 | 7.02E-03 | 2        | 2           |
| LNU778                                                                                                                                                                                                                                    | 0.74 | 2.19E-02 | 3        | 3           | LNU778    | 0.79 | 1.12E-02 | 3        | 38          |
| LNU778                                                                                                                                                                                                                                    | 0.82 | 7.05E-03 | 3        | 6           | LNU779    | 0.77 | 1.61E-02 | 3        | 19          |
| LNU779                                                                                                                                                                                                                                    | 0.91 | 7.64E-04 | 3        | 3           | LNU779    | 0.74 | 2.40E-02 | 3        | 8           |
| LNU779                                                                                                                                                                                                                                    | 0.82 | 7.27E-03 | 3        | 38          | LNU779    | 0.73 | 2.55E-02 | 3        | 6           |
| LNU780                                                                                                                                                                                                                                    | 0.74 | 3.59E-02 | 4        | 1           | LNU780    | 0.73 | 1.56E-02 | 5        | 8           |
| LNU780                                                                                                                                                                                                                                    | 0.77 | 8.82E-03 | 5        | 38          | LNU780    | 0.76 | 1.80E-02 | 2        | 27          |
| LNU780                                                                                                                                                                                                                                    | 0.75 | 2.06E-02 | 2        | 17          | LNU780    | 0.91 | 6.27E-04 | 3        | 31          |
| LNU780                                                                                                                                                                                                                                    | 0.86 | 2.62E-03 | 3        | 19          | LNU780    | 0.82 | 7.00E-03 | 3        | 38          |
| LNU781                                                                                                                                                                                                                                    | 0.73 | 4.00E-02 | 6        | 17          | LNU781    | 0.74 | 2.31E-02 | 1        | 31          |
| LNU781                                                                                                                                                                                                                                    | 0.70 | 2.29E-02 | 5        | 19          | LNU781    | 0.83 | 3.24E-03 | 5        | 38          |
| LNU781                                                                                                                                                                                                                                    | 0.88 | 1.93E-03 | 2        | 27          | LNU781    | 0.89 | 1.49E-03 | 2        | 17          |
| LNU781                                                                                                                                                                                                                                    | 0.73 | 2.64E-02 | 3        | 15          | LNU782    | 0.79 | 2.01E-02 | 4        | 34          |
| LNU782                                                                                                                                                                                                                                    | 0.72 | 4.27E-02 | 4        | 21          | LNU782    | 0.71 | 5.05E-02 | 4        | 13          |
| LNU783                                                                                                                                                                                                                                    | 0.79 | 1.92E-02 | 6        | 13          | LNU783    | 0.73 | 2.48E-02 | 3        | 7           |
| LNU783                                                                                                                                                                                                                                    | 0.74 | 2.19E-02 | 3        | 36          | LNU784    | 0.76 | 2.89E-02 | 6        | 5           |
| LNU784                                                                                                                                                                                                                                    | 0.96 | 5.76E-05 | 2        | 27          | LNU784    | 0.92 | 4.48E-04 | 2        | 17          |
| LNU784                                                                                                                                                                                                                                    | 0.78 | 1.26E-02 | 3        | 35          | LNU785    | 0.73 | 3.88E-02 | 6        | 34          |
| LNU785                                                                                                                                                                                                                                    | 0.82 | 1.24E-02 | 6        | 12          | LNU785    | 0.85 | 7.06E-03 | 6        | 10          |
| LNU785                                                                                                                                                                                                                                    | 0.73 | 4.02E-02 | 6        | 4           | LNU785    | 0.78 | 2.36E-02 | 6        | 27          |
| LNU785                                                                                                                                                                                                                                    | 0.80 | 1.77E-02 | 6        | 13          | LNU785    | 0.81 | 8.50E-03 | 1        | 20          |
| LNU785                                                                                                                                                                                                                                    | 0.70 | 2.42E-02 | 5        | 7           | LNU785    | 0.76 | 1.15E-02 | 5        | 24          |

TABLE 25-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under low nitrogen and normal conditions (at vegetative stage) across Barley accessions |      |          |          |             |           |      |          |          |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|----------|----------|-------------|-----------|------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                                                                 | R    | P value  | Esp. set | Cor. Set ID | Gene Name | R    | P value  | Exp. set | Cor. Set ID |
| LNU785                                                                                                                                                                                                                                    | 0.80 | 5.77E-03 | 5        | 25          | LNU785    | 0.81 | 4.47E-03 | 5        | 33          |
| LNU785                                                                                                                                                                                                                                    | 0.94 | 1.75E-04 | 2        | 27          | LNU785    | 0.90 | 8.48E-04 | 2        | 17          |

Table 25. Provided are the correlations (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector (Cor))] under normal and low nitrogen conditions across barley varieties. P = p value.

TABLE 26

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under low nitrogen and normal conditions (at reproductive stage) across Barley accessions |       |          |          |             |           |       |          |          |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                                                                   | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU749                                                                                                                                                                                                                                      | 0.701 | 2.39E-02 | 3        | 4           | LNU749    | 0.744 | 1.36E-02 | 3        | 10          |
| LNU749                                                                                                                                                                                                                                      | 0.715 | 2.00E-02 | 3        | 12          | LNU749    | 0.730 | 1.66E-02 | 6        | 15          |
| LNU749                                                                                                                                                                                                                                      | 0.801 | 5.32E-03 | 6        | 10          | LNU749    | 0.713 | 2.05E-02 | 5        | 14          |
| LNU749                                                                                                                                                                                                                                      | 0.736 | 1.52E-02 | 4        | 9           | LNU750    | 0.707 | 2.22E-02 | 1        | 9           |
| LNU751                                                                                                                                                                                                                                      | 0.854 | 1.67E-03 | 3        | 13          | LNU753    | 0.713 | 2.06E-02 | 2        | 6           |
| LNU753                                                                                                                                                                                                                                      | 0.781 | 7.69E-03 | 2        | 7           | LNU753    | 0.814 | 4.12E-03 | 2        | 8           |
| LNU753                                                                                                                                                                                                                                      | 0.752 | 1.22E-02 | 2        | 12          | LNU753    | 0.793 | 6.18E-03 | 3        | 17          |
| LNU754                                                                                                                                                                                                                                      | 0.707 | 2.23E-02 | 5        | 2           | LNU754    | 0.708 | 2.21E-02 | 5        | 1           |
| LNU754                                                                                                                                                                                                                                      | 0.734 | 1.56E-02 | 5        | 3           | LNU756    | 0.759 | 1.10E-02 | 4        | 17          |
| LNU757                                                                                                                                                                                                                                      | 0.886 | 6.40E-04 | 2        | 14          | LNU757    | 0.837 | 2.52E-03 | 2        | 13          |
| LNU757                                                                                                                                                                                                                                      | 0.761 | 1.05E-02 | 6        | 10          | LNU757    | 0.747 | 1.29E-02 | 1        | 13          |
| LNU758                                                                                                                                                                                                                                      | 0.765 | 9.99E-03 | 6        | 15          | LNU758    | 0.746 | 1.32E-02 | 1        | 9           |
| LNU759                                                                                                                                                                                                                                      | 0.720 | 1.88E-02 | 2        | 5           | LNU759    | 0.739 | 1.45E-02 | 2        | 7           |
| LNU759                                                                                                                                                                                                                                      | 0.715 | 2.01E-02 | 2        | 8           | LNU760    | 0.732 | 1.61E-02 | 2        | 13          |
| LNU761                                                                                                                                                                                                                                      | 0.784 | 7.28E-03 | 3        | 17          | LNU761    | 0.759 | 1.08E-02 | 6        | 6           |
| LNU761                                                                                                                                                                                                                                      | 0.720 | 1.89E-02 | 6        | 5           | LNU761    | 0.737 | 1.49E-02 | 6        | 7           |
| LNU761                                                                                                                                                                                                                                      | 0.731 | 1.62E-02 | 6        | 8           | LNU761    | 0.745 | 1.33E-02 | 5        | 17          |
| LNU762                                                                                                                                                                                                                                      | 0.745 | 1.34E-02 | 5        | 13          | LNU763    | 0.721 | 1.87E-02 | 2        | 13          |
| LNU763                                                                                                                                                                                                                                      | 0.838 | 2.46E-03 | 6        | 15          | LNU763    | 0.797 | 5.78E-03 | 5        | 14          |
| LNU763                                                                                                                                                                                                                                      | 0.719 | 1.91E-02 | 4        | 15          | LNU764    | 0.729 | 1.68E-02 | 3        | 13          |
| LNU764                                                                                                                                                                                                                                      | 0.719 | 1.91E-02 | 3        | 16          | LNU764    | 0.746 | 1.32E-02 | 5        | 4           |
| LNU764                                                                                                                                                                                                                                      | 0.709 | 2.17E-02 | 5        | 10          | LNU764    | 0.762 | 1.03E-02 | 1        | 9           |
| LNU766                                                                                                                                                                                                                                      | 0.766 | 9.84E-03 | 2        | 9           | LNU766    | 0.718 | 1.94E-02 | 3        | 9           |
| LNU766                                                                                                                                                                                                                                      | 0.763 | 1.03E-02 | 1        | 17          | LNU766    | 0.782 | 7.49E-03 | 1        | 9           |
| LNU767                                                                                                                                                                                                                                      | 0.822 | 3.53E-03 | 5        | 17          | LNU768    | 0.728 | 1.70E-02 | 5        | 14          |
| LNU769                                                                                                                                                                                                                                      | 0.705 | 2.28E-02 | 2        | 1           | LNU769    | 0.713 | 2.07E-02 | 2        | 3           |
| LNU769                                                                                                                                                                                                                                      | 0.819 | 3.79E-03 | 3        | 4           | LNU769    | 0.820 | 3.67E-03 | 3        | 10          |
| LNU769                                                                                                                                                                                                                                      | 0.723 | 1.81E-02 | 1        | 16          | LNU770    | 0.732 | 1.62E-02 | 2        | 13          |
| LNU770                                                                                                                                                                                                                                      | 0.848 | 1.93E-03 | 3        | 13          | LNU770    | 0.772 | 8.95E-03 | 3        | 16          |
| LNU771                                                                                                                                                                                                                                      | 0.714 | 2.04E-02 | 6        | 11          | LNU771    | 0.724 | 1.80E-02 | 5        | 4           |
| LNU771                                                                                                                                                                                                                                      | 0.855 | 1.61E-03 | 1        | 5           | LNU772    | 0.718 | 1.93E-02 | 3        | 2           |
| LNU772                                                                                                                                                                                                                                      | 0.789 | 6.71E-03 | 6        | 15          | LNU773    | 0.801 | 5.36E-03 | 3        | 14          |
| LNU773                                                                                                                                                                                                                                      | 0.797 | 5.81E-03 | 3        | 13          | LNU773    | 0.860 | 1.43E-03 | 5        | 4           |
| LNU773                                                                                                                                                                                                                                      | 0.836 | 2.56E-03 | 1        | 4           | LNU774    | 0.765 | 9.96E-03 | 3        | 4           |
| LNU774                                                                                                                                                                                                                                      | 0.710 | 3.21E-02 | 6        | 16          | LNU774    | 0.848 | 1.94E-03 | 1        | 4           |
| LNU774                                                                                                                                                                                                                                      | 0.722 | 1.84E-02 | 1        | 10          | LNU775    | 0.842 | 2.23E-03 | 5        | 16          |
| LNU775                                                                                                                                                                                                                                      | 0.753 | 1.19E-02 | 4        | 5           | LNU776    | 0.804 | 5.07E-03 | 2        | 4           |
| LNU776                                                                                                                                                                                                                                      | 0.786 | 7.03E-03 | 2        | 14          | LNU776    | 0.717 | 1.97E-02 | 2        | 13          |
| LNU776                                                                                                                                                                                                                                      | 0.708 | 2.21E-02 | 5        | 17          | LNU777    | 0.834 | 2.67E-03 | 2        | 13          |
| LNU777                                                                                                                                                                                                                                      | 0.769 | 9.38E-03 | 4        | 4           | LNU778    | 0.709 | 2.16E-02 | 3        | 7           |
| LNU778                                                                                                                                                                                                                                      | 0.805 | 4.95E-03 | 3        | 10          | LNU778    | 0.714 | 2.04E-02 | 3        | 8           |
| LNU778                                                                                                                                                                                                                                      | 0.712 | 2.10E-02 | 3        | 12          | LNU778    | 0.750 | 1.24E-02 | 6        | 2           |
| LNU778                                                                                                                                                                                                                                      | 0.759 | 1.09E-02 | 4        | 2           | LNU778    | 0.803 | 5.15E-03 | 4        | 1           |
| LNU778                                                                                                                                                                                                                                      | 0.803 | 5.20E-03 | 4        | 3           | LNU779    | 0.856 | 1.58E-03 | 3        | 14          |
| LNU779                                                                                                                                                                                                                                      | 0.873 | 9.80E-04 | 3        | 13          | LNU779    | 0.772 | 8.88E-03 | 5        | 10          |
| LNU781                                                                                                                                                                                                                                      | 0.715 | 2.01E-02 | 3        | 15          | LNU782    | 0.733 | 1.58E-02 | 3        | 13          |
| LNU782                                                                                                                                                                                                                                      | 0.776 | 8.33E-03 | 5        | 4           | LNU782    | 0.730 | 1.66E-02 | 4        | 17          |
| LNU782                                                                                                                                                                                                                                      | 0.784 | 7.30E-03 | 4        | 9           | LNU782    | 0.806 | 4.87E-03 | 1        | 4           |
| LNU782                                                                                                                                                                                                                                      | 0.858 | 1.48E-03 | 1        | 10          | LNU783    | 0.734 | 1.57E-02 | 2        | 6           |
| LNU783                                                                                                                                                                                                                                      | 0.829 | 3.01E-03 | 2        | 7           | LNU783    | 0.848 | 1.93E-03 | 2        | 8           |
| LNU783                                                                                                                                                                                                                                      | 0.800 | 5.45E-03 | 2        | 12          | LNU783    | 0.758 | 1.11E-02 | 3        | 4           |
| LNU783                                                                                                                                                                                                                                      | 0.734 | 1.57E-02 | 3        | 16          | LNU783    | 0.724 | 1.79E-02 | 5        | 15          |
| LNU783                                                                                                                                                                                                                                      | 0.885 | 6.72E-04 | 1        | 16          | LNU784    | 0.801 | 5.32E-03 | 3        | 14          |
| LNU784                                                                                                                                                                                                                                      | 0.763 | 1.03E-02 | 3        | 13          | LNU784    | 0.846 | 2.03E-03 | 5        | 10          |
| LNU784                                                                                                                                                                                                                                      | 0.744 | 1.37E-02 | 4        | 15          | LNU784    | 0.713 | 2.07E-02 | 4        | 10          |

TABLE 26-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under low nitrogen and normal conditions (at reproductive stage) across Barley accessions |       |          |          |             |           |       |          |          |             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                                                                   | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU784                                                                                                                                                                                                                                      | 0.779 | 7.88E-03 | 1        | 4           | LNU784    | 0.832 | 2.86E-03 | 1        | 10          |
| LNU785                                                                                                                                                                                                                                      | 0.740 | 1.43E-02 | 5        | 14          |           |       |          |          |             |

Table 26. Provided are the correlations (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector (Cor))] under normal and low nitrogen conditions across barley varieties. P = p value.

TABLE 27

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under drought conditions across Barley accessions |       |          |          |             |           |       |          |          |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                           | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU749                                                                                                                                                                                              | 0.859 | 2.82E-02 | 1        | 18          | LNU749    | 0.780 | 6.74E-02 | 1        | 11          |
| LNU749                                                                                                                                                                                              | 0.818 | 4.66E-02 | 1        | 20          | LNU749    | 0.798 | 1.76E-02 | 3        | 10          |
| LNU749                                                                                                                                                                                              | 0.759 | 2.90E-02 | 3        | 16          | LNU749    | 0.727 | 4.12E-02 | 3        | 11          |
| LNU749                                                                                                                                                                                              | 0.735 | 3.79E-02 | 5        | 22          | LNU749    | 0.858 | 6.39E-03 | 5        | 4           |
| LNU749                                                                                                                                                                                              | 0.763 | 2.77E-02 | 5        | 15          | LNU749    | 0.739 | 2.30E-02 | 4        | 19          |
| LNU749                                                                                                                                                                                              | 0.844 | 1.69E-02 | 4        | 13          | LNU749    | 0.730 | 2.56E-02 | 4        | 12          |
| LNU749                                                                                                                                                                                              | 0.717 | 2.96E-02 | 4        | 14          | LNU750    | 0.855 | 2.99E-02 | 1        | 12          |
| LNU750                                                                                                                                                                                              | 0.820 | 4.59E-02 | 1        | 2           | LNU750    | 0.872 | 2.37E-02 | 1        | 14          |
| LNU750                                                                                                                                                                                              | 0.912 | 4.21E-03 | 3        | 13          | LNU750    | 0.816 | 1.35E-02 | 3        | 14          |
| LNU750                                                                                                                                                                                              | 0.787 | 2.05E-02 | 3        | 1           | LNU750    | 0.700 | 7.97E-02 | 2        | 6           |
| LNU751                                                                                                                                                                                              | 0.754 | 8.34E-02 | 1        | 2           | LNU751    | 0.762 | 7.82E-02 | 1        | 14          |
| LNU751                                                                                                                                                                                              | 0.743 | 9.09E-02 | 1        | 1           | LNU751    | 0.778 | 2.29E-02 | 3        | 10          |
| LNU751                                                                                                                                                                                              | 0.887 | 3.28E-03 | 3        | 11          | LNU751    | 0.737 | 5.88E-02 | 2        | 1           |
| LNU751                                                                                                                                                                                              | 0.700 | 3.56E-02 | 4        | 12          | LNU753    | 0.734 | 3.82E-02 | 3        | 21          |
| LNU753                                                                                                                                                                                              | 0.843 | 1.73E-02 | 2        | 21          | LNU753    | 0.819 | 2.41E-02 | 2        | 12          |
| LNU753                                                                                                                                                                                              | 0.777 | 2.33E-02 | 5        | 10          | LNU753    | 0.840 | 9.13E-03 | 5        | 11          |
| LNU753                                                                                                                                                                                              | 0.749 | 3.24E-02 | 5        | 2           | LNU754    | 0.743 | 9.03E-02 | 1        | 21          |
| LNU754                                                                                                                                                                                              | 0.711 | 4.80E-02 | 3        | 12          | LNU754    | 0.849 | 1.57E-02 | 6        | 13          |
| LNU754                                                                                                                                                                                              | 0.747 | 2.08E-02 | 6        | 2           | LNU754    | 0.706 | 3.36E-02 | 6        | 14          |
| LNU754                                                                                                                                                                                              | 0.970 | 6.62E-05 | 5        | 14          | LNU756    | 0.784 | 6.48E-02 | 1        | 19          |
| LNU756                                                                                                                                                                                              | 0.797 | 5.77E-02 | 1        | 23          | LNU756    | 0.945 | 3.89E-04 | 3        | 19          |
| LNU756                                                                                                                                                                                              | 0.767 | 2.64E-02 | 3        | 22          | LNU756    | 0.830 | 5.66E-03 | 6        | 16          |
| LNU756                                                                                                                                                                                              | 0.825 | 2.23E-02 | 2        | 5           | LNU756    | 0.835 | 1.93E-02 | 2        | 6           |
| LNU756                                                                                                                                                                                              | 0.744 | 5.51E-02 | 2        | 20          | LNU756    | 0.883 | 3.69E-03 | 5        | 19          |
| LNU756                                                                                                                                                                                              | 0.886 | 1.45E-03 | 4        | 19          | LNU756    | 0.818 | 7.03E-03 | 4        | 22          |
| LNU756                                                                                                                                                                                              | 0.758 | 1.79E-02 | 4        | 4           | LNU757    | 0.713 | 1.12E-01 | 1        | 10          |
| LNU757                                                                                                                                                                                              | 0.857 | 2.94E-02 | 1        | 23          | LNU757    | 0.712 | 1.13E-01 | 1        | 6           |
| LNU757                                                                                                                                                                                              | 0.798 | 5.73E-02 | 1        | 17          | LNU757    | 0.759 | 7.99E-02 | 1        | 20          |
| LNU757                                                                                                                                                                                              | 0.754 | 5.01E-02 | 2        | 11          | LNU757    | 0.882 | 3.71E-03 | 5        | 19          |
| LNU758                                                                                                                                                                                              | 0.842 | 8.67E-03 | 3        | 12          | LNU758    | 0.777 | 3.98E-02 | 2        | 16          |
| LNU758                                                                                                                                                                                              | 0.768 | 1.56E-02 | 4        | 14          | LNU759    | 0.708 | 1.15E-01 | 1        | 16          |
| LNU759                                                                                                                                                                                              | 0.855 | 6.85E-03 | 3        | 21          | LNU761    | 0.712 | 1.13E-01 | 1        | 18          |
| LNU761                                                                                                                                                                                              | 0.804 | 1.62E-02 | 3        | 11          | LNU761    | 0.765 | 2.71E-02 | 5        | 17          |
| LNU762                                                                                                                                                                                              | 0.774 | 7.09E-02 | 1        | 7           | LNU762    | 0.933 | 6.54E-03 | 1        | 18          |
| LNU762                                                                                                                                                                                              | 0.755 | 8.26E-02 | 1        | 5           | LNU762    | 0.922 | 8.91E-03 | 1        | 6           |
| LNU762                                                                                                                                                                                              | 0.914 | 1.08E-02 | 1        | 11          | LNU762    | 0.977 | 7.65E-04 | 1        | 20          |
| LNU762                                                                                                                                                                                              | 0.934 | 6.70E-04 | 3        | 7           | LNU762    | 0.865 | 5.58E-03 | 3        | 5           |
| LNU762                                                                                                                                                                                              | 0.840 | 9.05E-03 | 3        | 6           | LNU762    | 0.752 | 3.14E-02 | 5        | 4           |
| LNU762                                                                                                                                                                                              | 0.731 | 3.94E-02 | 5        | 15          | LNU764    | 0.811 | 1.46E-02 | 3        | 22          |
| LNU764                                                                                                                                                                                              | 0.838 | 9.40E-03 | 3        | 4           | LNU764    | 0.700 | 5.30E-02 | 3        | 15          |
| LNU764                                                                                                                                                                                              | 0.812 | 7.89E-03 | 6        | 5           | LNU764    | 0.772 | 1.47E-02 | 6        | 6           |
| LNU764                                                                                                                                                                                              | 0.798 | 3.13E-02 | 6        | 8           | LNU764    | 0.824 | 2.26E-02 | 2        | 10          |
| LNU764                                                                                                                                                                                              | 0.794 | 3.31E-02 | 2        | 22          | LNU764    | 0.871 | 1.08E-02 | 2        | 2           |
| LNU764                                                                                                                                                                                              | 0.904 | 5.15E-03 | 2        | 1           | LNU764    | 0.724 | 1.04E-01 | 5        | 13          |
| LNU764                                                                                                                                                                                              | 0.858 | 6.46E-03 | 5        | 11          | LNU764    | 0.869 | 1.11E-02 | 4        | 13          |
| LNU764                                                                                                                                                                                              | 0.725 | 2.72E-02 | 4        | 14          | LNU764    | 0.852 | 1.50E-02 | 4        | 8           |
| LNU766                                                                                                                                                                                              | 0.845 | 3.41E-02 | 1        | 21          | LNU766    | 0.797 | 1.79E-02 | 3        | 22          |
| LNU766                                                                                                                                                                                              | 0.838 | 9.35E-03 | 3        | 7           | LNU766    | 0.731 | 3.95E-02 | 3        | 16          |
| LNU766                                                                                                                                                                                              | 0.787 | 2.03E-02 | 3        | 18          | LNU766    | 0.897 | 2.51E-03 | 3        | 5           |
| LNU766                                                                                                                                                                                              | 0.939 | 5.37E-04 | 3        | 6           | LNU766    | 0.714 | 4.66E-02 | 3        | 4           |
| LNU766                                                                                                                                                                                              | 0.832 | 1.04E-02 | 3        | 20          | LNU766    | 0.833 | 5.27E-03 | 4        | 19          |
| LNU766                                                                                                                                                                                              | 0.864 | 2.69E-03 | 4        | 22          | LNU766    | 0.867 | 2.49E-03 | 4        | 4           |
| LNU767                                                                                                                                                                                              | 0.782 | 6.60E-02 | 1        | 23          | LNU767    | 0.754 | 8.34E-02 | 1        | 11          |
| LNU767                                                                                                                                                                                              | 0.764 | 7.73E-02 | 1        | 20          | LNU767    | 0.920 | 1.20E-03 | 3        | 17          |
| LNU767                                                                                                                                                                                              | 0.737 | 2.34E-02 | 6        | 1           | LNU767    | 0.740 | 5.72E-02 | 2        | 23          |

TABLE 27-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under drought conditions across Barley accessions |       |          |          |             |           |       |          |          |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                           | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU767                                                                                                                                                                                              | 0.876 | 9.67E-03 | 2        | 11          | LNU768    | 0.769 | 7.37E-02 | 1        | 12          |
| LNU768                                                                                                                                                                                              | 0.774 | 2.43E-02 | 3        | 7           | LNU768    | 0.894 | 6.70E-03 | 2        | 16          |
| LNU768                                                                                                                                                                                              | 0.766 | 4.48E-02 | 2        | 1           | LNU768    | 0.787 | 1.19E-02 | 4        | 14          |
| LNU770                                                                                                                                                                                              | 0.854 | 3.03E-02 | 1        | 23          | LNU770    | 0.849 | 7.68E-03 | 3        | 19          |
| LNU770                                                                                                                                                                                              | 0.861 | 6.00E-03 | 3        | 22          | LNU770    | 0.730 | 6.26E-02 | 6        | 8           |
| LNU770                                                                                                                                                                                              | 0.728 | 6.37E-02 | 2        | 7           | LNU770    | 0.709 | 7.46E-02 | 2        | 5           |
| LNU770                                                                                                                                                                                              | 0.769 | 4.31E-02 | 2        | 6           | LNU770    | 0.817 | 2.49E-02 | 2        | 9           |
| LNU770                                                                                                                                                                                              | 0.708 | 7.53E-02 | 2        | 20          | LNU770    | 0.752 | 1.95E-02 | 4        | 19          |
| LNU771                                                                                                                                                                                              | 0.735 | 9.61E-02 | 1        | 10          | LNU771    | 0.860 | 1.30E-02 | 3        | 13          |
| LNU771                                                                                                                                                                                              | 0.806 | 1.58E-02 | 3        | 2           | LNU771    | 0.852 | 7.21E-03 | 3        | 14          |
| LNU771                                                                                                                                                                                              | 0.779 | 2.26E-02 | 3        | 1           | LNU771    | 0.829 | 2.12E-02 | 3        | 8           |
| LNU771                                                                                                                                                                                              | 0.725 | 2.70E-02 | 6        | 20          | LNU771    | 0.830 | 2.08E-02 | 2        | 21          |
| LNU771                                                                                                                                                                                              | 0.766 | 4.46E-02 | 2        | 5           | LNU771    | 0.749 | 5.28E-02 | 2        | 6           |
| LNU771                                                                                                                                                                                              | 0.858 | 1.34E-02 | 2        | 11          | LNU771    | 0.822 | 2.32E-02 | 2        | 12          |
| LNU771                                                                                                                                                                                              | 0.958 | 2.60E-03 | 5        | 13          | LNU771    | 0.838 | 9.44E-03 | 5        | 14          |
| LNU771                                                                                                                                                                                              | 0.921 | 1.18E-03 | 5        | 1           | LNU771    | 0.710 | 3.22E-02 | 4        | 7           |
| LNU771                                                                                                                                                                                              | 0.701 | 3.55E-02 | 4        | 5           | LNU771    | 0.742 | 2.20E-02 | 4        | 6           |
| LNU771                                                                                                                                                                                              | 0.745 | 2.13E-02 | 4        | 17          | LNU771    | 0.753 | 1.91E-02 | 4        | 20          |
| LNU772                                                                                                                                                                                              | 0.738 | 9.40E-02 | 1        | 18          | LNU772    | 0.749 | 3.25E-02 | 3        | 2           |
| LNU772                                                                                                                                                                                              | 0.708 | 3.29E-02 | 6        | 22          | LNU772    | 0.848 | 3.90E-03 | 6        | 4           |
| LNU772                                                                                                                                                                                              | 0.754 | 3.05E-02 | 5        | 10          | LNU772    | 0.811 | 1.47E-02 | 5        | 2           |
| LNU772                                                                                                                                                                                              | 0.790 | 1.14E-02 | 4        | 2           | LNU773    | 0.772 | 2.49E-02 | 3        | 22          |
| LNU773                                                                                                                                                                                              | 0.802 | 1.66E-02 | 3        | 18          | LNU773    | 0.720 | 6.80E-02 | 3        | 8           |
| LNU773                                                                                                                                                                                              | 0.899 | 5.87E-03 | 6        | 8           | LNU773    | 0.796 | 3.24E-02 | 2        | 16          |
| LNU774                                                                                                                                                                                              | 0.713 | 1.12E-01 | 1        | 22          | LNU774    | 0.705 | 1.18E-01 | 1        | 2           |
| LNU774                                                                                                                                                                                              | 0.739 | 2.28E-02 | 6        | 12          | LNU774    | 0.791 | 1.95E-02 | 5        | 17          |
| LNU775                                                                                                                                                                                              | 0.747 | 3.30E-02 | 3        | 21          | LNU775    | 0.800 | 1.70E-02 | 3        | 11          |
| LNU775                                                                                                                                                                                              | 0.729 | 4.03E-02 | 3        | 14          | LNU775    | 0.725 | 6.51E-02 | 6        | 8           |
| LNU775                                                                                                                                                                                              | 0.822 | 2.33E-02 | 2        | 16          | LNU775    | 0.718 | 4.50E-02 | 5        | 9           |
| LNU775                                                                                                                                                                                              | 0.731 | 3.92E-02 | 5        | 12          | LNU775    | 0.802 | 9.27E-03 | 4        | 21          |
| LNU776                                                                                                                                                                                              | 0.811 | 5.04E-02 | 1        | 1           | LNU776    | 0.808 | 1.52E-02 | 3        | 10          |
| LNU776                                                                                                                                                                                              | 0.777 | 2.33E-02 | 3        | 2           | LNU776    | 0.778 | 3.94E-02 | 2        | 2           |
| LNU776                                                                                                                                                                                              | 0.734 | 6.04E-02 | 2        | 14          | LNU776    | 0.786 | 3.61E-02 | 2        | 1           |
| LNU776                                                                                                                                                                                              | 0.904 | 8.21E-04 | 4        | 10          | LNU776    | 0.741 | 2.25E-02 | 4        | 2           |
| LNU777                                                                                                                                                                                              | 0.947 | 3.54E-04 | 3        | 10          | LNU777    | 0.892 | 2.88E-03 | 3        | 2           |
| LNU778                                                                                                                                                                                              | 0.712 | 4.75E-02 | 3        | 23          | LNU778    | 0.709 | 3.24E-02 | 6        | 7           |
| LNU778                                                                                                                                                                                              | 0.789 | 1.16E-02 | 6        | 5           | LNU778    | 0.805 | 8.79E-03 | 6        | 6           |
| LNU778                                                                                                                                                                                              | 0.784 | 3.71E-02 | 2        | 21          | LNU778    | 0.975 | 9.07E-04 | 5        | 8           |
| LNU778                                                                                                                                                                                              | 0.703 | 3.45E-02 | 4        | 19          | LNU778    | 0.748 | 2.04E-02 | 4        | 22          |
| LNU780                                                                                                                                                                                              | 0.778 | 6.87E-02 | 1        | 23          | LNU780    | 0.785 | 3.65E-02 | 6        | 8           |
| LNU781                                                                                                                                                                                              | 0.807 | 5.20E-02 | 1        | 18          | LNU781    | 0.917 | 1.00E-02 | 1        | 5           |
| LNU781                                                                                                                                                                                              | 0.837 | 3.79E-02 | 1        | 6           | LNU781    | 0.880 | 2.06E-02 | 1        | 11          |
| LNU781                                                                                                                                                                                              | 0.765 | 7.63E-02 | 1        | 20          | LNU781    | 0.910 | 1.68E-03 | 3        | 22          |
| LNU782                                                                                                                                                                                              | 0.818 | 4.67E-02 | 1        | 15          | LNU782    | 0.889 | 3.18E-03 | 3        | 11          |
| LNU782                                                                                                                                                                                              | 0.715 | 3.04E-02 | 6        | 7           | LNU782    | 0.886 | 7.89E-03 | 2        | 12          |
| LNU782                                                                                                                                                                                              | 0.908 | 4.65E-03 | 2        | 14          | LNU782    | 0.721 | 4.37E-02 | 5        | 9           |
| LNU782                                                                                                                                                                                              | 0.856 | 3.21E-03 | 4        | 11          | LNU782    | 0.747 | 2.06E-02 | 4        | 14          |
| LNU783                                                                                                                                                                                              | 0.762 | 2.81E-02 | 3        | 2           | LNU783    | 0.735 | 2.40E-02 | 6        | 10          |
| LNU783                                                                                                                                                                                              | 0.820 | 2.39E-02 | 2        | 21          | LNU784    | 0.782 | 6.61E-02 | 1        | 18          |
| LNU784                                                                                                                                                                                              | 0.897 | 1.54E-02 | 1        | 5           | LNU784    | 0.790 | 6.13E-02 | 1        | 6           |
| LNU784                                                                                                                                                                                              | 0.746 | 8.83E-02 | 1        | 11          | LNU784    | 0.724 | 1.04E-01 | 1        | 20          |
| LNU784                                                                                                                                                                                              | 0.701 | 5.29E-02 | 3        | 22          | LNU784    | 0.776 | 4.02E-02 | 3        | 8           |
| LNU784                                                                                                                                                                                              | 0.748 | 2.04E-02 | 6        | 5           | LNU784    | 0.885 | 8.15E-03 | 6        | 8           |
| LNU784                                                                                                                                                                                              | 0.710 | 3.20E-02 | 4        | 17          | LNU785    | 0.726 | 1.03E-01 | 1        | 23          |
| LNU785                                                                                                                                                                                              | 0.706 | 1.17E-01 | 1        | 18          | LNU785    | 0.779 | 6.77E-02 | 1        | 6           |
| LNU785                                                                                                                                                                                              | 0.845 | 3.43E-02 | 1        | 11          | LNU785    | 0.846 | 3.39E-02 | 1        | 20          |
| LNU785                                                                                                                                                                                              | 0.708 | 4.96E-02 | 3        | 20          | LNU785    | 0.708 | 7.53E-02 | 2        | 23          |
| LNU785                                                                                                                                                                                              | 0.738 | 5.81E-02 | 2        | 17          | LNU785    | 0.769 | 4.31E-02 | 4        | 13          |
| LNU785                                                                                                                                                                                              | 0.813 | 7.74E-03 | 4        | 1           | LNU834    | 0.826 | 4.28E-02 | 1        | 10          |
| LNU834                                                                                                                                                                                              | 0.866 | 2.56E-02 | 1        | 22          | LNU834    | 0.767 | 7.48E-02 | 1        | 2           |
| LNU834                                                                                                                                                                                              | 0.765 | 7.64E-02 | 1        | 14          | LNU834    | 0.824 | 6.35E-03 | 6        | 11          |
| LNU834                                                                                                                                                                                              | 0.782 | 3.78E-02 | 2        | 21          | LNU834    | 0.810 | 2.71E-02 | 2        | 5           |
| LNU834                                                                                                                                                                                              | 0.792 | 3.36E-02 | 2        | 6           | LNU834    | 0.838 | 1.87E-02 | 2        | 12          |
| LNU834                                                                                                                                                                                              | 0.708 | 7.50E-02 | 2        | 20          | LNU839    | 0.826 | 4.28E-02 | 1        | 10          |
| LNU839                                                                                                                                                                                              | 0.866 | 2.56E-02 | 1        | 22          | LNU839    | 0.767 | 7.48E-02 | 1        | 2           |
| LNU839                                                                                                                                                                                              | 0.765 | 7.64E-02 | 1        | 14          | LNU839    | 0.824 | 6.35E-03 | 6        | 11          |
| LNU839                                                                                                                                                                                              | 0.782 | 3.78E-02 | 2        | 21          | LNU839    | 0.810 | 2.71E-02 | 2        | 5           |
| LNU839                                                                                                                                                                                              | 0.792 | 3.36E-02 | 2        | 6           | LNU839    | 0.838 | 1.87E-02 | 2        | 12          |
| LNU839                                                                                                                                                                                              | 0.708 | 7.50E-02 | 2        | 20          |           |       |          |          |             |

Table 27. Provided are the correlations (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector (Cor))] under drought conditions across barley varieties. P = p value.

Production of *Sorghum* Transcriptom and High Throughput Correlation Analysis with Yield, NUE, and ABST Related Parameters Measured in Fields Using 44K *Sorghum* Oligonucleotide Micro-Arrays

In order to produce a high throughput correlation analysis between plant phenotype and gene expression level, the present inventors utilized a *sorghum* oligonucleotide micro-array, produced by Agilent Technologies [chem. (dot) agilent (dot) com/Scripts/PDS (dot) asp?1Page=50879]. The array oligonucleotide represents about 44,000 *sorghum* genes and transcripts. In order to define correlations between the levels of RNA expression with ABST, yield and NUE components or vigor related parameters, various plant characteristics of 17 different *sorghum* hybrids were analyzed. Among them, 10 hybrids encompassing the observed variance were selected for RNA expression analysis. The correlation between the RNA levels and the characterized parameters was analyzed using Pearson correlation test [davidmlane (dot) com/hyperstat/A34739 (dot) html].

Correlation of *Sorghum* Varieties Across Ecotypes Grown under Regular Growth Conditions, Severe Drought Conditions and Low Nitrogen Conditions

#### Experimental Procedures

17 *Sorghum* varieties were grown in 3 repetitive plots, in field. Briefly, the growing protocol was as follows:

1. Regular growth conditions: *sorghum* plants were grown in the field using commercial fertilization and irrigation protocols (370 liter per meter, fertilization of 14 units of 21% urea per entire growth period).

2. Drought conditions: *sorghum* seeds were sown in soil and grown under normal condition until around 35 days from sowing, around stage V8 (eight green leaves are fully expanded, booting not started yet). At this point, irrigation was stopped, and severe drought stress was developed.

3. Low Nitrogen fertilization conditions: *sorghum* plants were fertilized with 50% less amount of nitrogen in the field than the amount of nitrogen applied in the regular growth treatment. All the fertilizer was applied before flowering.

Analyzed *Sorghum* tissues—All 10 selected *Sorghum* hybrids were sample per each treatment. Tissues [Flag leaf, Flower meristem and Flower] from plants growing under normal conditions, severe drought stress and low nitrogen conditions were sampled and RNA was extracted as described above. Each micro-array expression information tissue type has received a Set ID as summarized in Table 28 below.

TABLE 28

| Sorghum transcriptom expression sets in field experiments |        |
|-----------------------------------------------------------|--------|
| Expression Set                                            | Set ID |
| Sorghum field/flag leaf/Drought                           | 1      |
| Sorghum field/flag leaf/Low N                             | 2      |
| Sorghum field/flag leaf/Normal                            | 3      |
| Sorghum field/flower meristem/Drought                     | 4      |
| Sorghum field/flower meristem/Low N                       | 5      |
| Sorghum field/flower meristem/Normal                      | 6      |

TABLE 28-continued

| Sorghum transcriptom expression sets in field experiments |        |
|-----------------------------------------------------------|--------|
| Expression Set                                            | Set ID |
| Sorghum field/flower/Drought                              | 7      |
| Sorghum field/flower/Low N                                | 8      |
| Sorghum field/flower/Normal                               | 9      |

Table 28: Provided are the sorghum transcriptom expression sets.

Flag leaf = the leaf below the flower;

Flower meristem = Apical meristem following panicle initiation;

Flower = the flower at the anthesis day.

The following parameters were collected using digital imaging system:

15 Average Grain Area (cm<sup>2</sup>)—At the end of the growing period the grains were separated from the Plant 'Head'. A sample of ~200 grains were weighted, photographed and images were processed using the below described image processing system. The grain area was measured from those images and was divided by the number of grains.

20 Average Grain Length (cm)—At the end of the growing period the grains were separated from the Plant 'Head'. A sample of ~200 grains were weighted, photographed and images were processed using the below described image processing system. The sum of grain lengths (longest axis) was measured from those images and was divided by the number of grains.

25 Head Average Area (cm<sup>2</sup>)—At the end of the growing period 5 'Heads' were, photographed and images were processed using the below described image processing system. The 'Head' area was measured from those images and was divided by the number of 'Heads'.

30 Head Average Length (cm)—At the end of the growing period 5 'Heads' were, photographed and images were processed using the below described image processing system. The 'Head' length (longest axis) was measured from those images and was divided by the number of 'Heads'.

35 An image processing system was used, which consists of a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.37, Java based image processing software, which was developed at the U.S. National Institutes of Health and is freely available on the internet at rsbweb (dot) nih (dot) gov/. Images were captured in resolution of 10 Mega Pixels (3888x2592 pixels) and stored in a low compression JPEG (Joint Photographic Experts Group standard) format. Next, image processing output data for seed area and seed length was saved to text files and analyzed using the JMP statistical analysis software (SAS institute).

40 Additional parameters were collected either by sampling 5 plants per plot or by measuring the parameter across all the plants within the plot.

45 Total Seed Weight per Head (gr.)—At the end of the experiment (plant 'Heads') heads from plots within blocks A-C were collected. 5 heads were separately threshed and grains were weighted, all additional heads were threshed together and weighted as well. The average grain weight per head was calculated by dividing the total grain weight by number of total heads per plot (based on plot). In case of 5 heads, the total grains weight of 5 heads was divided by 5.

50 FW Head per Plant gram—At the end of the experiment (when heads were harvested) total heads and 5 selected heads per plots within blocks A-C were collected separately. The heads (total and 5) were weighted (gr.) separately, and the average fresh weight per plant was calculated for total (FW Head/Plant gr. based on plot) and for 5 (FW Head/Plant gr. based on 5 plants) heads.

Plant height—Plants were characterized for height during growing period at 5 time points. In each measure, plants were measured for their height using a measuring tape. Height was measured from ground level to top of the longest leaf.

Plant leaf number—Plants were characterized for leaf number during growing period at 5 time points. In each measure, plants were measured for their leaf number by counting all the leaves of 3 selected plants per plot.

Relative Growth Rate—was calculated using Formulas III (above) and VIII (above).

SPAD—Chlorophyll content was determined using a Minolta SPAD 502 chlorophyll meter and measurement was performed 64 days post sowing. SPAD meter readings were done on young fully developed leaf. Three measurements per leaf were taken per plot.

Vegetative dry weight and Heads—At the end of the experiment (when inflorescence were dry) all inflorescence and vegetative material from plots within blocks A-C were collected. The biomass and heads weight of each plot was separated, measured and divided by the number of heads.

Dry weight=total weight of the vegetative portion above ground (excluding roots) after drying at 70° C. in oven for 48 hours;

Harvest Index (HI) (*Sorghum*)—The harvest index was calculated using Formula XVI above.

FW Heads/(FW Heads+FW Plants)—The total fresh weight of heads and their respective plant biomass was measured at the harvest day. The heads weight was divided by the sum of weights of heads and plants.

#### Experimental Results

17 different *sorghum* hybrids were grown and characterized for different parameters (Table 29). The average for each of the measured parameter was calculated using the JMP software (Tables 30-35) and a subsequent correlation analysis was performed (Table 36). Results were then integrated to the database.

TABLE 29

| Sorghum correlated parameters (vectors) |                                                    |  |
|-----------------------------------------|----------------------------------------------------|--|
| Correlation ID                          | Correlated parameter with                          |  |
| 1                                       | Average Grain Area (cm <sup>2</sup> ), Drought     |  |
| 2                                       | Average Grain Area (cm <sup>2</sup> ), Low N       |  |
| 3                                       | Average Grain Area (cm <sup>2</sup> ), Normal      |  |
| 4                                       | FW-Head/Plant gr (based on plot), Drought          |  |
| 5                                       | FW-Head/Plant gr (based on plot), Low N            |  |
| 6                                       | FW-Head/Plant gr (based on plot), Normal           |  |
| 7                                       | FW-Head/Plant gr (based on 5 plants), Low N        |  |
| 8                                       | FW-Head/Plant gr (based on 5 plants), Normal       |  |
| 9                                       | FW Heads/(FW Heads + FW Plants)(all plot), Drought |  |
| 10                                      | FW Heads/(FW Heads + FW Plants)(all plot), Low N   |  |

TABLE 29-continued

| Sorghum correlated parameters (vectors) |                                                       |  |
|-----------------------------------------|-------------------------------------------------------|--|
| Correlation ID                          | Correlated parameter with                             |  |
| 11                                      | FW Heads/(FW Heads + FW Plants)(all plot), Normal     |  |
| 12                                      | FW/Plant gr (based on plot), Drought                  |  |
| 13                                      | FW/Plant gr (based on plot), Low N                    |  |
| 14                                      | FW/Plant gr (based on plot), Normal                   |  |
| 15                                      | Final Plant Height (cm), Drought                      |  |
| 16                                      | Final Plant Height (cm), Low N                        |  |
| 17                                      | Final Plant Height (cm), Normal                       |  |
| 18                                      | Head Average Area (cm <sup>2</sup> ), Drought         |  |
| 19                                      | Head Average Area (cm <sup>2</sup> ), Low N           |  |
| 20                                      | Head Average Area (cm <sup>2</sup> ), Normal          |  |
| 21                                      | Head Average Length (cm), Drought                     |  |
| 22                                      | Head Average Length (cm), Low N                       |  |
| 23                                      | Head Average Length (cm), Normal                      |  |
| 24                                      | Head Average Perimeter (cm), Drought                  |  |
| 25                                      | Head Average Perimeter (cm), Low N                    |  |
| 26                                      | Head Average Perimeter (cm), Normal                   |  |
| 27                                      | Head Average Width (cm), Drought                      |  |
| 28                                      | Head Average Width (cm), Low N                        |  |
| 29                                      | Head Average Width (cm), Normal                       |  |
| 30                                      | Leaf SPAD 64 DPS (Days Post Sowing), Drought          |  |
| 31                                      | Leaf SPAD 64 DPS (Days Post Sowing), Low N            |  |
| 32                                      | Leaf SPAD 64 DPS (Days Post Sowing), Normal           |  |
| 33                                      | Lower Ratio Average Grain Area, Low N                 |  |
| 34                                      | Lower Ratio Average Grain Area, Normal                |  |
| 35                                      | Lower Ratio Average Grain Length, Low N               |  |
| 36                                      | Lower Ratio Average Grain Length, Normal              |  |
| 37                                      | Lower Ratio Average Grain Perimeter, Low N            |  |
| 38                                      | Lower Ratio Average Grain Perimeter, Normal           |  |
| 39                                      | Lower Ratio Average Grain Width, Low N                |  |
| 40                                      | Lower Ratio Average Grain Width, Normal               |  |
| 41                                      | Total grain weight/Head (based on plot) gr, Low N     |  |
| 42                                      | Total grain weight/Head gr (based on 5 heads), Low N  |  |
| 43                                      | Total grain weight/Head gr (based on 5 heads), Normal |  |
| 44                                      | Total grain weight/Head gr (based on plot), Normal    |  |
| 45                                      | Total grain weight/Head gr (based on plot) Drought    |  |
| 46                                      | Upper Ratio Average Grain Area, Drought               |  |
| 47                                      | Upper Ratio Average Grain Area, Low N                 |  |
| 48                                      | Upper Ratio Average Grain Area, Normal                |  |
| 49                                      | [Grain Yield + plant biomass/SPAD 64 DPS], Normal     |  |
| 50                                      | [Grain Yield + plant biomass/SPAD 64 DPS], Low N      |  |
| 51                                      | [Grain yield/SPAD 64 DPS], Low N                      |  |
| 52                                      | [Grain yield/SPAD 64 DPS], Normal                     |  |
| 53                                      | [Plant biomass (FW)/SPAD 64 DPS], Drought             |  |
| 54                                      | [Plant biomass (FW)/SPAD 64 DPS], Low N               |  |
| 55                                      | [Plant biomass (FW)/SPAD 64 DPS], Normal              |  |

Table 29. Provided are the Sorghum correlated parameters (vectors).

“gr.” = grams;

“SPAD” = chlorophyll levels;

“FW” = Plant Fresh weight;

“DW” = Plant Dry weight;

“normal” = standard growth conditions;

“DPS” = days post-sowing;

“Low N” = Low Nitrogen.

FW-Head/Plant gr. (based on 5 plants), fresh weigh of the harvested heads was divided by the number of heads that were phenotyped, Low N-low nitrogen conditions: Lower Ratio Average Grain Area area of the lower fraction of grains.

TABLE 30

| Measured parameters in Sorghum accessions under normal conditions |      |        |        |      |        |        |        |       |       |      |
|-------------------------------------------------------------------|------|--------|--------|------|--------|--------|--------|-------|-------|------|
| Seed ID/Cor. ID                                                   | 3    | 6      | 8      | 11   | 14     | 17     | 20     | 23    | 26    | 29   |
| Line-1                                                            | 0.11 | 175.15 | 406.50 | 0.51 | 162.56 | 95.25  | 120.14 | 25.58 | 61.22 | 5.97 |
| Line-2                                                            | 0.11 | 223.49 | 518.00 | 0.51 | 212.59 | 79.20  | 167.60 | 26.84 | 67.90 | 7.92 |
| Line-3                                                            | 0.13 | 56.40  | 148.00 | 0.12 | 334.83 | 197.85 | 85.14  | 21.02 | 56.26 | 4.87 |
| Line-4                                                            | 0.13 | 111.62 | 423.00 | 0.26 | 313.46 | 234.20 | 157.26 | 26.84 | 65.38 | 7.43 |
| Line-5                                                            | 0.14 | 67.34  | 92.00  | 0.12 | 462.28 | 189.40 | 104.00 | 23.14 | 67.46 | 5.59 |
| Line-6                                                            | 0.14 | 66.90  | 101.33 | 0.18 | 318.26 | 194.67 | 102.48 | 21.82 | 67.46 | 5.88 |
| Line-7                                                            | 0.11 | 126.18 | 423.50 | 0.46 | 151.14 | 117.25 | 168.54 | 31.33 | 74.35 | 6.78 |
| Line-8                                                            | 0.11 | 107.74 | 386.50 | 0.43 | 137.60 | 92.80  | 109.32 | 23.18 | 56.16 | 5.99 |
| Line-9                                                            | 0.10 | 123.86 | 409.50 | 0.43 | 167.98 | 112.65 | 135.13 | 25.70 | 61.64 | 6.62 |

TABLE 30-continued

| Measured parameters in Sorghum accessions under normal conditions |      |        |        |      |        |        |        |       |       |      |
|-------------------------------------------------------------------|------|--------|--------|------|--------|--------|--------|-------|-------|------|
| Seed ID/Cor. ID                                                   | 3    | 6      | 8      | 11   | 14     | 17     | 20     | 23    | 26    | 29   |
| Line-10                                                           | 0.12 | 102.75 | 328.95 | 0.44 | 128.97 | 97.50  | 169.03 | 28.82 | 71.41 | 7.42 |
| Line-11                                                           | 0.12 | 82.33  | 391.00 | 0.46 | 97.62  | 98.00  | 156.10 | 28.13 | 68.57 | 6.99 |
| Line-12                                                           | 0.11 | 77.59  | 435.75 | 0.45 | 99.32  | 100.00 | 112.14 | 22.97 | 56.44 | 6.19 |
| Line-13                                                           | 0.12 | 91.17  | 429.50 | 0.45 | 112.24 | 105.60 | 154.74 | 28.09 | 67.79 | 7.02 |
| Line-14                                                           | 0.11 | 150.45 | 441.00 | 0.51 | 157.42 | 151.15 | 171.70 | 30.00 | 71.55 | 7.18 |
| Line-15                                                           | 0.11 | 109.10 | 415.75 | 0.46 | 130.55 | 117.10 | 168.51 | 30.54 | 78.94 | 7.00 |
| Line-16                                                           | 0.11 | 107.58 | 429.50 | 0.44 | 135.66 | 124.45 | 162.51 | 27.17 | 67.03 | 7.39 |

Table 30: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under normal conditions. Growth conditions are specified in the experimental procedure section.

TABLE 31

| Additional measured parameters in Sorghum accessions under normal conditions |       |      |      |      |      |       |       |      |       |       |      |
|------------------------------------------------------------------------------|-------|------|------|------|------|-------|-------|------|-------|-------|------|
| Seed ID/Cor. ID                                                              | 32    | 34   | 36   | 38   | 40   | 43    | 44    | 48   | 49    | 52    | 55   |
| Line-1                                                                       | 43.01 | 0.83 | 0.91 | 0.91 | 0.91 | 47.40 | 31.12 | 1.22 | 4.50  | 3.78  | 0.72 |
| Line-2                                                                       |       | 0.74 | 0.88 | 0.87 | 0.83 | 46.30 | 26.35 | 1.30 | 8.17  | 7.74  | 0.43 |
| Line-3                                                                       | 43.26 | 0.78 | 0.92 | 0.91 | 0.85 | 28.37 | 18.72 | 1.13 | 7.87  | 7.01  | 0.86 |
| Line-4                                                                       | 44.74 | 0.80 | 0.91 | 0.95 | 0.87 | 70.40 | 38.38 | 1.14 | 10.68 | 10.10 | 0.58 |
| Line-5                                                                       | 45.76 | 0.70 | 0.89 | 0.90 | 0.79 | 32.15 | 26.67 | 1.16 | 8.34  | 7.65  | 0.69 |
| Line-6                                                                       | 41.61 | 0.70 | 0.88 | 0.92 | 0.80 | 49.23 | 28.85 | 1.15 | 4.40  | 3.34  | 1.05 |
| Line-7                                                                       | 45.21 | 0.83 | 0.91 | 0.91 | 0.90 | 63.45 | 47.67 | 1.19 | 3.74  | 3.05  | 0.69 |
| Line-8                                                                       | 45.14 | 0.81 | 0.90 | 0.91 | 0.89 | 44.45 | 31.00 | 1.24 | 4.83  | 3.90  | 0.93 |
| Line-9                                                                       | 43.03 | 0.84 | 0.92 | 0.92 | 0.92 | 56.65 | 39.99 | 1.25 | 3.67  | 2.83  | 0.84 |
| Line-10                                                                      | 45.59 | 0.79 | 0.92 | 0.93 | 0.85 | 60.00 | 38.36 | 1.24 | 2.89  | 2.18  | 0.72 |
| Line-11                                                                      | 44.83 | 0.77 | 0.89 | 0.91 | 0.86 | 45.45 | 32.10 | 1.32 | 2.91  | 2.19  | 0.72 |
| Line-12                                                                      | 45.33 | 0.80 | 0.91 | 0.92 | 0.89 | 58.19 | 32.69 | 1.22 | 3.12  | 2.41  | 0.71 |
| Line-13                                                                      | 46.54 | 0.81 | 0.91 | 0.90 | 0.90 | 70.60 | 32.79 | 1.18 | 4.75  | 3.58  | 1.17 |
| Line-14                                                                      | 43.99 | 0.82 | 0.91 | 0.91 | 0.91 | 70.10 | 51.53 | 1.18 | 3.69  | 2.90  | 0.79 |
| Line-15                                                                      | 45.09 | 0.81 | 0.90 | 0.91 | 0.91 | 53.95 | 35.71 | 1.22 | 3.85  | 3.01  | 0.85 |
| Line-16                                                                      | 45.14 | 0.82 | 0.90 | 0.91 | 0.90 | 59.87 | 38.31 | 1.25 | 5.84  | 4.85  | 0.98 |

Table 31: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under normal conditions. Growth conditions are specified in the experimental procedure section.

40

TABLE 32

| Measured parameters in Sorghum accessions under Low nitrogen conditions |      |        |        |      |        |        |        |       |       |       |       |
|-------------------------------------------------------------------------|------|--------|--------|------|--------|--------|--------|-------|-------|-------|-------|
| Seed ID/Cor. ID                                                         | 2    | 5      | 7      | 10   | 13     | 16     | 19     | 22    | 25    | 28    | 31    |
| Line-1                                                                  | 0.11 | 214.78 | 388.00 | 0.51 | 204.78 | 104.00 | 96.24  | 23.22 | 56.32 | 5.26  | 38.33 |
| Line-2                                                                  | 0.11 | 205.05 | 428.67 | 0.51 | 199.64 | 80.93  | 214.72 | 25.58 | 79.20 | 10.41 | 38.98 |
| Line-3                                                                  | 0.14 | 73.49  | 297.67 | 0.17 | 340.51 | 204.73 | 98.59  | 20.93 | 53.25 | 5.93  | 42.33 |
| Line-4                                                                  | 0.12 | 122.96 | 280.00 | 0.39 | 240.60 | 125.40 | 182.83 | 28.43 | 76.21 | 8.25  | 40.90 |
| Line-5                                                                  | 0.14 | 153.07 | 208.33 | 0.21 | 537.78 | 225.40 | 119.64 | 24.32 | 67.27 | 6.19  | 43.15 |
| Line-6                                                                  | 0.13 | 93.23  | 303.67 | 0.19 | 359.40 | 208.07 | 110.19 | 22.64 | 59.49 | 6.12  | 39.85 |
| Line-7                                                                  | 0.12 | 134.11 | 436.00 | 0.48 | 149.20 | 121.40 | 172.36 | 32.11 | 79.28 | 6.81  | 42.68 |
| Line-8                                                                  | 0.12 | 77.44  | 376.33 | 0.38 | 129.06 | 100.27 | 84.81  | 20.38 | 51.52 | 5.25  | 43.31 |
| Line-9                                                                  | 0.12 | 129.63 | 474.67 | 0.42 | 178.71 | 121.13 | 156.25 | 26.69 | 69.89 | 7.52  | 39.01 |
| Line-10                                                                 | 0.13 | 99.83  | 437.67 | 0.44 | 124.27 | 94.53  | 136.71 | 26.31 | 66.18 | 6.59  | 42.71 |
| Line-11                                                                 | 0.13 | 76.95  | 383.00 | 0.43 | 101.33 | 110.00 | 137.70 | 25.43 | 67.37 | 6.85  | 40.08 |
| Line-12                                                                 | 0.12 | 84.25  | 375.00 | 0.39 | 132.12 | 115.07 | 96.54  | 23.11 | 57.90 | 5.32  | 43.98 |
| Line-13                                                                 | 0.12 | 92.24  | 425.00 | 0.44 | 117.90 | 104.73 | 158.19 | 27.87 | 70.61 | 7.25  | 45.44 |
| Line-14                                                                 | 0.12 | 138.83 | 434.00 | 0.44 | 176.99 | 173.67 | 163.95 | 28.88 | 73.76 | 7.19  | 44.75 |
| Line-15                                                                 | 0.11 | 113.32 | 408.67 | 0.44 | 143.67 | 115.60 | 138.39 | 27.64 | 66.87 | 6.28  | 42.85 |
| Line-16                                                                 | 0.12 | 95.50  | 378.50 | 0.43 | 126.98 | 138.80 | 135.46 | 25.52 | 65.40 | 6.57  | 43.81 |

Table 32: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under low nitrogen conditions. Growth conditions are specified in the experimental procedure section.

TABLE 33

| Additional measured parameters in Sorghum accessions under low nitrogen growth conditions |      |      |      |      |       |       |      |       |      |       |
|-------------------------------------------------------------------------------------------|------|------|------|------|-------|-------|------|-------|------|-------|
| Seed ID/Cor. ID                                                                           | 33   | 35   | 37   | 39   | 41    | 42    | 47   | 50    | 51   | 54    |
| Line-1                                                                                    | 0.82 | 0.91 | 0.90 | 0.90 | 25.95 | 50.27 | 1.19 | 6.02  | 0.68 | 5.34  |
| Line-2                                                                                    | 0.77 | 0.90 | 0.88 | 0.85 | 30.57 | 50.93 | 1.31 | 5.91  | 0.78 | 5.12  |
| Line-3                                                                                    | 0.81 | 0.92 | 0.92 | 0.89 | 19.37 | 36.13 | 1.11 | 8.50  | 0.46 | 8.05  |
| Line-4                                                                                    | 0.79 | 0.90 | 0.90 | 0.88 | 35.62 | 73.10 | 1.22 | 6.75  | 0.87 | 5.88  |
| Line-5                                                                                    | 0.78 | 0.91 | 0.92 | 0.86 | 25.18 | 37.87 | 1.19 | 13.05 | 0.58 | 12.46 |
| Line-6                                                                                    | 0.80 | 0.93 | 0.92 | 0.87 | 22.18 | 36.40 | 1.18 | 9.58  | 0.56 | 9.02  |
| Line-7                                                                                    | 0.83 | 0.92 | 0.92 | 0.91 | 49.96 | 71.67 | 1.16 | 4.67  | 1.17 | 3.50  |
| Line-8                                                                                    | 0.79 | 0.89 | 0.89 | 0.89 | 27.48 | 35.00 | 1.23 | 3.61  | 0.63 | 2.98  |
| Line-9                                                                                    | 0.81 | 0.90 | 0.90 | 0.90 | 51.12 | 76.73 | 1.17 | 5.89  | 1.31 | 4.58  |
| Line-10                                                                                   | 0.77 | 0.91 | 0.91 | 0.86 | 36.84 | 57.58 | 1.22 | 3.77  | 0.86 | 2.91  |
| Line-11                                                                                   | 0.74 | 0.89 | 0.90 | 0.84 | 29.45 | 42.93 | 1.24 | 3.26  | 0.74 | 2.53  |
| Line-12                                                                                   | 0.80 | 0.90 | 0.90 | 0.90 | 26.70 | 36.47 | 1.19 | 3.61  | 0.61 | 3.00  |
| Line-13                                                                                   | 0.79 | 0.89 | 0.90 | 0.89 | 29.43 | 68.60 | 1.23 | 3.24  | 0.65 | 2.60  |
| Line-14                                                                                   | 0.82 | 0.91 | 0.91 | 0.91 | 51.12 | 71.80 | 1.16 | 5.10  | 1.14 | 3.96  |
| Line-15                                                                                   | 0.80 | 0.89 | 0.89 | 0.90 | 37.04 | 49.27 | 1.34 | 4.25  | 0.87 | 3.38  |
| Line-16                                                                                   | 0.81 | 0.89 | 0.90 | 0.90 | 39.85 | 43.87 | 1.21 | 3.81  | 0.91 | 2.90  |
| Line-17                                                                                   | 0.81 | 0.90 | 0.90 | 0.90 | 41.78 | 52.07 | 1.21 | 4.76  | 0.89 | 3.86  |

Table 33: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under low nitrogen conditions. Growth conditions are specified in the experimental procedure section.

TABLE 34

| Measured parameters in Sorghum accessions under drought conditions |      |        |      |        |        |        |       |       |      |       |
|--------------------------------------------------------------------|------|--------|------|--------|--------|--------|-------|-------|------|-------|
| Seed ID/Cor. ID                                                    | 1    | 4      | 9    | 12     | 15     | 18     | 21    | 24    | 27   | 30    |
| Line-1                                                             | 0.10 | 154.90 | 0.42 | 207.99 | 89.40  | 83.14  | 21.63 | 52.78 | 4.83 | 40.58 |
| Line-2                                                             | 0.12 | 122.02 | 0.47 | 138.02 | 75.73  | 107.79 | 21.94 | 64.49 | 6.31 | 40.88 |
| Line-3                                                             | 0.11 | 130.51 | 0.42 | 255.41 | 92.10  | 88.68  | 21.75 | 56.59 | 5.16 | 45.01 |
| Line-4                                                             | 0.09 | 241.11 | 0.37 | 402.22 | 94.30  | 135.91 | 22.01 | 64.37 | 7.78 | 42.30 |
| Line-5                                                             | 0.09 | 69.03  | 0.23 | 233.55 | 150.08 | 90.77  | 20.99 | 53.21 | 5.28 | 45.24 |
| Line-6                                                             | 0.11 | 186.41 | 0.31 | 391.75 | 110.73 | 123.95 | 28.60 | 71.66 | 5.49 | 40.56 |
| Line-7                                                             |      | 62.11  | 0.41 | 89.31  | 99.20  | 86.06  | 21.35 | 55.61 | 5.04 | 44.80 |
| Line-8                                                             |      | 39.02  | 0.44 | 50.61  | 84.00  | 85.20  | 20.81 | 52.96 | 5.07 | 45.07 |
| Line-9                                                             |      | 58.94  | 0.40 | 87.02  | 99.00  | 113.10 | 24.69 | 69.83 | 5.77 | 40.65 |
| Line-10                                                            |      | 76.37  | 0.44 | 120.43 | 92.20  | 100.79 | 24.82 | 65.15 | 5.37 | 45.43 |
| Line-11                                                            |      | 33.47  | 0.47 | 37.21  | 81.93  | 80.41  | 21.95 | 55.27 | 4.66 | 42.58 |
| Line-12                                                            |      | 42.20  | 0.47 | 48.18  | 98.80  | 126.89 | 24.98 | 69.06 | 6.35 | 44.18 |
| Line-13                                                            |      | 41.53  | 0.48 | 44.20  | 86.47  | 86.41  | 19.49 | 53.32 | 5.58 | 44.60 |
| Line-14                                                            |      | 131.67 | 0.35 | 231.60 | 99.60  | 92.29  | 20.42 | 56.29 | 5.76 | 42.41 |
| Line-15                                                            |      | 60.84  | 0.35 | 116.01 | 83.00  | 77.89  | 16.81 | 49.12 | 5.86 | 43.25 |
| Line-16                                                            |      | 44.33  | 0.23 | 123.09 | 83.53  | 76.93  | 18.88 | 51.88 | 5.10 | 40.30 |
| Line-17                                                            |      | 185.44 | 0.33 | 342.50 | 92.30  |        |       |       |      | 40.75 |

Table 34: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under drought conditions. Growth conditions are specified in the experimental procedure section.

TABLE 35

| Additional Measured parameters in Sorghum accessions under drought conditions |         |       |       | 50 |
|-------------------------------------------------------------------------------|---------|-------|-------|----|
| Seed ID/<br>Correlation ID                                                    | 45      | 46    | 53    |    |
| Line-1                                                                        | 22.114  | 1.305 | 5.126 | 55 |
| Line-2                                                                        | 16.770  | 1.190 | 3.376 |    |
| Line-3                                                                        | 9.189   | 1.285 | 5.674 |    |
| Line-4                                                                        | 104.444 | 1.459 | 9.509 |    |
| Line-5                                                                        | 3.235   | 1.206 | 5.163 |    |
| Line-6                                                                        | 21.997  | 1.214 | 9.658 | 60 |
| Line-7                                                                        | 9.975   |       | 1.993 |    |
| Line-8                                                                        | 18.579  |       | 1.123 |    |
| Line-9                                                                        | 29.271  |       | 2.141 |    |
| Line-10                                                                       | 10.453  |       | 2.651 |    |
| Line-11                                                                       | 14.765  |       | 0.874 | 65 |
| Line-12                                                                       | 12.861  |       | 1.091 |    |

TABLE 35-continued

| Additional Measured parameters in Sorghum accessions under drought conditions |        |    |       |
|-------------------------------------------------------------------------------|--------|----|-------|
| Seed ID/<br>Correlation ID                                                    | 45     | 46 | 53    |
| Line-13                                                                       | 18.237 |    | 0.991 |
| Line-14                                                                       | 11.602 |    | 5.461 |
| Line-15                                                                       | 18.647 |    | 2.682 |
| Line-16                                                                       | 16.356 |    | 3.054 |
| Line-17                                                                       |        |    | 8.405 |

Table 35: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under drought conditions. Growth conditions are specified in the experimental procedure section.

TABLE 36

| Correlation between the expression level of selected genes of some embodiments of the invention<br>in various tissues and the phenotypic performance under normal or abiotic stress conditions<br>across Sorghum accessions |       |          |         |                |           |       |          |         |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|---------|----------------|-----------|-------|----------|---------|----------------|
| Gene Name                                                                                                                                                                                                                   | R     | P value  | Exp.set | Cor.<br>Set ID | Gene Name | R     | P value  | Exp.set | Cor.<br>Set ID |
| LNU856                                                                                                                                                                                                                      | 0.849 | 3.76E-03 | 1       | 18             | LNU856    | 0.827 | 5.96E-03 | 1       | 27             |
| LNU856                                                                                                                                                                                                                      | 0.830 | 5.57E-03 | 1       | 24             | LNU857    | 0.748 | 2.04E-02 | 9       | 55             |
| LNU858                                                                                                                                                                                                                      | 0.841 | 2.31E-03 | 6       | 36             | LNU858    | 0.781 | 7.71E-03 | 6       | 34             |
| LNU858                                                                                                                                                                                                                      | 0.741 | 1.41E-02 | 2       | 41             | LNU858    | 0.721 | 1.85E-02 | 2       | 51             |
| LNU858                                                                                                                                                                                                                      | 0.788 | 6.74E-03 | 2       | 16             | LNU858    | 0.736 | 1.53E-02 | 3       | 11             |
| LNU858                                                                                                                                                                                                                      | 0.826 | 3.23E-03 | 3       | 6              | LNU858    | 0.711 | 2.10E-02 | 3       | 8              |
| LNU859                                                                                                                                                                                                                      | 0.717 | 1.97E-02 | 6       | 55             | LNU859    | 0.829 | 3.04E-03 | 9       | 17             |
| LNU859                                                                                                                                                                                                                      | 0.713 | 2.07E-02 | 9       | 40             | LNU859    | 0.736 | 1.52E-02 | 9       | 23             |
| LNU859                                                                                                                                                                                                                      | 0.819 | 3.78E-03 | 9       | 44             | LNU859    | 0.785 | 7.10E-03 | 9       | 43             |
| LNU859                                                                                                                                                                                                                      | 0.706 | 2.26E-02 | 9       | 34             | LNU859    | 0.764 | 1.00E-02 | 2       | 41             |
| LNU859                                                                                                                                                                                                                      | 0.782 | 7.47E-03 | 2       | 16             | LNU859    | 0.717 | 1.97E-02 | 8       | 42             |
| LNU860                                                                                                                                                                                                                      | 0.789 | 6.70E-03 | 6       | 17             | LNU860    | 0.706 | 2.24E-02 | 6       | 44             |
| LNU860                                                                                                                                                                                                                      | 0.773 | 8.80E-03 | 2       | 41             | LNU860    | 0.711 | 2.11E-02 | 2       | 22             |
| LNU860                                                                                                                                                                                                                      | 0.891 | 5.43E-04 | 2       | 42             | LNU860    | 0.757 | 1.13E-02 | 2       | 51             |
| LNU860                                                                                                                                                                                                                      | 0.760 | 1.07E-02 | 2       | 37             | LNU860    | 0.877 | 8.51E-04 | 4       | 53             |
| LNU860                                                                                                                                                                                                                      | 0.854 | 1.65E-03 | 4       | 4              | LNU860    | 0.878 | 8.41E-04 | 4       | 12             |
| LNU860                                                                                                                                                                                                                      | 0.728 | 1.69E-02 | 5       | 41             | LNU860    | 0.845 | 2.10E-03 | 5       | 16             |
| LNU860                                                                                                                                                                                                                      | 0.713 | 3.09E-02 | 7       | 18             | LNU860    | 0.723 | 1.81E-02 | 1       | 53             |
| LNU860                                                                                                                                                                                                                      | 0.726 | 1.74E-02 | 1       | 12             | LNU861    | 0.835 | 2.63E-03 | 6       | 17             |
| LNU861                                                                                                                                                                                                                      | 0.707 | 2.22E-02 | 6       | 44             | LNU861    | 0.794 | 6.15E-03 | 2       | 16             |
| LNU861                                                                                                                                                                                                                      | 0.792 | 6.35E-03 | 4       | 53             | LNU861    | 0.802 | 5.22E-03 | 4       | 4              |
| LNU861                                                                                                                                                                                                                      | 0.790 | 6.53E-03 | 4       | 12             | LNU861    | 0.871 | 2.26E-03 | 3       | 52             |
| LNU861                                                                                                                                                                                                                      | 0.874 | 2.05E-03 | 3       | 49             | LNU861    | 0.892 | 5.26E-04 | 1       | 53             |
| LNU861                                                                                                                                                                                                                      | 0.890 | 5.56E-04 | 1       | 4              | LNU861    | 0.879 | 8.08E-04 | 1       | 12             |
| LNU862                                                                                                                                                                                                                      | 0.716 | 1.98E-02 | 6       | 40             | LNU862    | 0.767 | 9.63E-03 | 4       | 53             |
| LNU862                                                                                                                                                                                                                      | 0.767 | 9.58E-03 | 4       | 12             | LNU862    | 0.726 | 2.69E-02 | 3       | 55             |
| LNU862                                                                                                                                                                                                                      | 0.797 | 5.81E-03 | 3       | 43             | LNU862    | 0.753 | 1.20E-02 | 1       | 15             |
| LNU863                                                                                                                                                                                                                      | 0.857 | 3.15E-03 | 9       | 55             | LNU863    | 0.758 | 1.11E-02 | 2       | 16             |
| LNU863                                                                                                                                                                                                                      | 0.878 | 8.46E-04 | 5       | 31             | LNU863    | 0.776 | 8.30E-03 | 7       | 53             |
| LNU863                                                                                                                                                                                                                      | 0.751 | 1.22E-02 | 7       | 4              | LNU863    | 0.770 | 9.20E-03 | 7       | 12             |
| LNU864                                                                                                                                                                                                                      | 0.816 | 3.97E-03 | 2       | 16             | LNU864    | 0.700 | 2.42E-02 | 3       | 29             |
| LNU864                                                                                                                                                                                                                      | 0.729 | 1.67E-02 | 3       | 14             | LNU864    | 0.736 | 1.53E-02 | 7       | 4              |
| LNU864                                                                                                                                                                                                                      | 0.708 | 2.20E-02 | 7       | 12             | LNU865    | 0.719 | 1.90E-02 | 6       | 44             |
| LNU865                                                                                                                                                                                                                      | 0.740 | 1.43E-02 | 9       | 11             | LNU865    | 0.754 | 1.17E-02 | 2       | 10             |
| LNU865                                                                                                                                                                                                                      | 0.742 | 1.40E-02 | 5       | 13             | LNU865    | 0.774 | 8.53E-03 | 3       | 8              |
| LNU866                                                                                                                                                                                                                      | 0.752 | 1.22E-02 | 2       | 41             | LNU866    | 0.844 | 2.13E-03 | 2       | 16             |
| LNU866                                                                                                                                                                                                                      | 0.848 | 3.91E-03 | 3       | 52             | LNU866    | 0.746 | 1.32E-02 | 3       | 11             |
| LNU866                                                                                                                                                                                                                      | 0.868 | 1.13E-03 | 3       | 6              | LNU866    | 0.805 | 8.85E-03 | 3       | 49             |
| LNU866                                                                                                                                                                                                                      | 0.734 | 1.56E-02 | 1       | 4              | LNU867    | 0.719 | 1.92E-02 | 6       | 3              |
| LNU867                                                                                                                                                                                                                      | 0.704 | 2.31E-02 | 3       | 6              | LNU868    | 0.916 | 2.00E-04 | 6       | 48             |
| LNU868                                                                                                                                                                                                                      | 0.804 | 5.04E-03 | 2       | 16             | LNU868    | 0.821 | 3.59E-03 | 3       | 17             |
| LNU868                                                                                                                                                                                                                      | 0.819 | 3.75E-03 | 3       | 44             | LNU869    | 0.719 | 1.90E-02 | 2       | 2              |
| LNU869                                                                                                                                                                                                                      | 0.790 | 6.49E-03 | 5       | 2              | LNU870    | 0.906 | 3.04E-04 | 4       | 53             |
| LNU870                                                                                                                                                                                                                      | 0.829 | 3.00E-03 | 4       | 4              | LNU870    | 0.912 | 2.33E-04 | 4       | 12             |
| LNU870                                                                                                                                                                                                                      | 0.723 | 1.82E-02 | 1       | 53             | LNU870    | 0.733 | 1.58E-02 | 1       | 12             |
| LNU871                                                                                                                                                                                                                      | 0.752 | 1.22E-02 | 6       | 17             | LNU871    | 0.720 | 1.89E-02 | 4       | 53             |
| LNU871                                                                                                                                                                                                                      | 0.709 | 2.16E-02 | 4       | 4              | LNU871    | 0.735 | 1.53E-02 | 4       | 12             |
| LNU871                                                                                                                                                                                                                      | 0.747 | 1.30E-02 | 7       | 9              | LNU871    | 0.717 | 2.98E-02 | 1       | 21             |
| LNU872                                                                                                                                                                                                                      | 0.714 | 2.05E-02 | 4       | 53             | LNU872    | 0.710 | 2.13E-02 | 4       | 12             |
| LNU872                                                                                                                                                                                                                      | 0.735 | 1.55E-02 | 5       | 41             | LNU872    | 0.743 | 2.19E-02 | 7       | 18             |
| LNU873                                                                                                                                                                                                                      | 0.732 | 1.61E-02 | 9       | 44             | LNU873    | 0.848 | 1.95E-03 | 8       | 35             |
| LNU873                                                                                                                                                                                                                      | 0.768 | 1.56E-02 | 3       | 55             | LNU874    | 0.715 | 2.02E-02 | 2       | 22             |
| LNU874                                                                                                                                                                                                                      | 0.855 | 1.60E-03 | 2       | 42             | LNU874    | 0.727 | 1.72E-02 | 4       | 53             |
| LNU874                                                                                                                                                                                                                      | 0.710 | 2.15E-02 | 4       | 4              | LNU874    | 0.736 | 1.53E-02 | 4       | 12             |
| LNU874                                                                                                                                                                                                                      | 0.724 | 1.79E-02 | 5       | 54             | LNU874    | 0.777 | 8.13E-03 | 5       | 13             |
| LNU875                                                                                                                                                                                                                      | 0.839 | 2.41E-03 | 6       | 3              | LNU876    | 0.793 | 6.15E-03 | 6       | 17             |
| LNU876                                                                                                                                                                                                                      | 0.705 | 3.38E-02 | 4       | 27             | LNU876    | 0.867 | 1.17E-03 | 4       | 53             |
| LNU876                                                                                                                                                                                                                      | 0.809 | 4.56E-03 | 4       | 4              | LNU876    | 0.866 | 1.21E-03 | 4       | 12             |
| LNU876                                                                                                                                                                                                                      | 0.780 | 7.72E-03 | 5       | 5              | LNU876    | 0.731 | 1.62E-02 | 5       | 7              |
| LNU876                                                                                                                                                                                                                      | 0.830 | 2.95E-03 | 5       | 50             | LNU876    | 0.776 | 8.26E-03 | 5       | 54             |
| LNU876                                                                                                                                                                                                                      | 0.842 | 2.24E-03 | 5       | 13             | LNU876    | 0.793 | 1.07E-02 | 3       | 52             |
| LNU876                                                                                                                                                                                                                      | 0.784 | 1.24E-02 | 3       | 49             | LNU876    | 0.894 | 4.83E-04 | 3       | 8              |
| LNU878                                                                                                                                                                                                                      | 0.718 | 1.94E-02 | 6       | 11             | LNU878    | 0.725 | 1.76E-02 | 6       | 49             |
| LNU878                                                                                                                                                                                                                      | 0.778 | 8.03E-03 | 2       | 16             | LNU879    | 0.756 | 1.15E-02 | 6       | 11             |
| LNU879                                                                                                                                                                                                                      | 0.707 | 2.21E-02 | 6       | 6              | LNU879    | 0.704 | 2.32E-02 | 6       | 14             |
| LNU879                                                                                                                                                                                                                      | 0.771 | 9.10E-03 | 2       | 28             | LNU879    | 0.913 | 2.22E-04 | 4       | 53             |
| LNU879                                                                                                                                                                                                                      | 0.820 | 3.70E-03 | 4       | 4              | LNU879    | 0.916 | 1.99E-04 | 4       | 12             |
| LNU879                                                                                                                                                                                                                      | 0.717 | 1.97E-02 | 5       | 5              | LNU879    | 0.773 | 8.76E-03 | 5       | 50             |
| LNU879                                                                                                                                                                                                                      | 0.734 | 1.56E-02 | 5       | 54             | LNU879    | 0.849 | 1.89E-03 | 5       | 13             |
| LNU880                                                                                                                                                                                                                      | 0.718 | 1.93E-02 | 2       | 47             | LNU881    | 0.789 | 6.64E-03 | 2       | 41             |
| LNU881                                                                                                                                                                                                                      | 0.730 | 1.66E-02 | 2       | 51             | LNU881    | 0.755 | 1.17E-02 | 2       | 37             |
| LNU881                                                                                                                                                                                                                      | 0.931 | 8.91E-05 | 2       | 16             | LNU882    | 0.785 | 1.22E-02 | 3       | 52             |
| LNU902                                                                                                                                                                                                                      | 0.886 | 6.47E-04 | 6       | 17             | LNU902    | 0.856 | 1.59E-03 | 6       | 44             |

TABLE 36-continued

| Correlation between the expression level of selected genes of some embodiments of the invention<br>in various tissues and the phenotypic performance under normal or abiotic stress conditions<br>across Sorghum accessions |       |          |         |                |           |       |          |         |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|---------|----------------|-----------|-------|----------|---------|----------------|
| Gene Name                                                                                                                                                                                                                   | R     | P value  | Exp.set | Cor.<br>Set ID | Gene Name | R     | P value  | Exp.set | Cor.<br>Set ID |
| LNU903                                                                                                                                                                                                                      | 0.714 | 2.04E-02 | 6       | 3              | LNU903    | 0.785 | 7.13E-03 | 2       | 7              |
| LNU903                                                                                                                                                                                                                      | 0.738 | 1.48E-02 | 2       | 19             | LNU903    | 0.829 | 3.05E-03 | 2       | 22             |
| LNU903                                                                                                                                                                                                                      | 0.786 | 7.04E-03 | 2       | 42             | LNU903    | 0.840 | 2.36E-03 | 2       | 25             |
| LNU904                                                                                                                                                                                                                      | 0.738 | 1.48E-02 | 6       | 52             | LNU904    | 0.731 | 1.64E-02 | 6       | 14             |
| LNU904                                                                                                                                                                                                                      | 0.751 | 1.24E-02 | 6       | 49             | LNU904    | 0.765 | 9.94E-03 | 4       | 53             |
| LNU904                                                                                                                                                                                                                      | 0.718 | 1.94E-02 | 4       | 4              | LNU904    | 0.767 | 9.63E-03 | 4       | 12             |
| LNU904                                                                                                                                                                                                                      | 0.732 | 1.61E-02 | 5       | 10             | LNU905    | 0.710 | 2.14E-02 | 2       | 47             |
| LNU905                                                                                                                                                                                                                      | 0.872 | 2.17E-03 | 4       | 45             | LNU905    | 0.800 | 5.42E-03 | 4       | 53             |
| LNU905                                                                                                                                                                                                                      | 0.854 | 1.65E-03 | 4       | 4              | LNU905    | 0.785 | 7.10E-03 | 4       | 12             |
| LNU905                                                                                                                                                                                                                      | 0.714 | 2.04E-02 | 8       | 5              | LNU905    | 0.725 | 1.76E-02 | 5       | 54             |
| LNU905                                                                                                                                                                                                                      | 0.761 | 1.06E-02 | 5       | 13             | LNU905    | 0.822 | 6.54E-03 | 7       | 45             |
| LNU905                                                                                                                                                                                                                      | 0.720 | 2.86E-02 | 1       | 45             | LNU906    | 0.749 | 1.26E-02 | 6       | 17             |
| LNU906                                                                                                                                                                                                                      | 0.778 | 8.04E-03 | 6       | 40             | LNU906    | 0.832 | 2.85E-03 | 6       | 44             |
| LNU906                                                                                                                                                                                                                      | 0.805 | 4.95E-03 | 6       | 34             | LNU906    | 0.745 | 1.35E-02 | 2       | 41             |
| LNU906                                                                                                                                                                                                                      | 0.855 | 1.63E-03 | 2       | 16             | LNU906    | 0.939 | 5.71E-05 | 4       | 53             |
| LNU906                                                                                                                                                                                                                      | 0.868 | 1.12E-03 | 4       | 4              | LNU906    | 0.943 | 4.37E-05 | 4       | 12             |
| LNU907                                                                                                                                                                                                                      | 0.700 | 2.42E-02 | 6       | 29             | LNU907    | 0.829 | 3.00E-03 | 6       | 52             |
| LNU907                                                                                                                                                                                                                      | 0.825 | 3.28E-03 | 6       | 49             | LNU907    | 0.790 | 6.50E-03 | 6       | 8              |
| LNU907                                                                                                                                                                                                                      | 0.791 | 6.44E-03 | 8       | 33             | LNU907    | 0.706 | 2.26E-02 | 8       | 39             |
| LNU907                                                                                                                                                                                                                      | 0.836 | 2.59E-03 | 8       | 35             | LNU907    | 0.746 | 1.32E-02 | 8       | 37             |
| LNU908                                                                                                                                                                                                                      | 0.701 | 2.41E-02 | 2       | 5              | LNU908    | 0.725 | 1.77E-02 | 1       | 4              |
| LNU909                                                                                                                                                                                                                      | 0.805 | 4.99E-03 | 2       | 41             | LNU909    | 0.745 | 1.34E-02 | 2       | 51             |
| LNU909                                                                                                                                                                                                                      | 0.920 | 1.66E-04 | 2       | 16             | LNU909    | 0.789 | 1.14E-02 | 4       | 45             |
| LNU909                                                                                                                                                                                                                      | 0.822 | 3.51E-03 | 3       | 11             | LNU909    | 0.771 | 9.03E-03 | 3       | 6              |
| LNU910                                                                                                                                                                                                                      | 0.761 | 1.05E-02 | 6       | 17             | LNU910    | 0.743 | 1.37E-02 | 6       | 44             |
| LNU910                                                                                                                                                                                                                      | 0.743 | 1.38E-02 | 5       | 41             | LNU910    | 0.732 | 1.62E-02 | 5       | 51             |
| LNU910                                                                                                                                                                                                                      | 0.767 | 9.66E-03 | 5       | 16             | LNU910    | 0.761 | 1.71E-02 | 3       | 52             |
| LNU910                                                                                                                                                                                                                      | 0.781 | 1.30E-02 | 3       | 49             | LNU910    | 0.763 | 1.02E-02 | 1       | 53             |
| LNU910                                                                                                                                                                                                                      | 0.761 | 1.05E-02 | 1       | 4              | LNU910    | 0.768 | 9.45E-03 | 1       | 12             |
| LNU911                                                                                                                                                                                                                      | 0.716 | 1.99E-02 | 6       | 11             | LNU911    | 0.774 | 8.56E-03 | 8       | 10             |
| LNU911                                                                                                                                                                                                                      | 0.708 | 2.18E-02 | 5       | 41             | LNU911    | 0.712 | 2.09E-02 | 5       | 51             |
| LNU911                                                                                                                                                                                                                      | 0.733 | 1.59E-02 | 3       | 6              | LNU911    | 0.760 | 1.08E-02 | 7       | 30             |
| LNU912                                                                                                                                                                                                                      | 0.773 | 8.74E-03 | 9       | 17             | LNU912    | 0.706 | 2.25E-02 | 9       | 44             |
| LNU912                                                                                                                                                                                                                      | 0.710 | 2.15E-02 | 9       | 43             | LNU912    | 0.712 | 2.08E-02 | 2       | 47             |
| LNU912                                                                                                                                                                                                                      | 0.702 | 3.48E-02 | 4       | 18             | LNU912    | 0.717 | 1.96E-02 | 7       | 15             |
| LNU912                                                                                                                                                                                                                      | 0.902 | 3.58E-04 | 1       | 30             | LNU913    | 0.713 | 2.06E-02 | 2       | 31             |
| LNU913                                                                                                                                                                                                                      | 0.705 | 2.29E-02 | 2       | 22             | LNU913    | 0.726 | 1.75E-02 | 2       | 37             |
| LNU913                                                                                                                                                                                                                      | 0.760 | 1.08E-02 | 3       | 17             | LNU913    | 0.746 | 1.33E-02 | 3       | 40             |
| LNU913                                                                                                                                                                                                                      | 0.821 | 3.63E-03 | 3       | 44             | LNU913    | 0.803 | 5.19E-03 | 3       | 36             |
| LNU913                                                                                                                                                                                                                      | 0.777 | 8.20E-03 | 3       | 34             | LNU914    | 0.713 | 2.07E-02 | 6       | 40             |
| LNU914                                                                                                                                                                                                                      | 0.759 | 1.09E-02 | 6       | 34             | LNU914    | 0.716 | 1.98E-02 | 9       | 8              |
| LNU914                                                                                                                                                                                                                      | 0.707 | 2.22E-02 | 5       | 51             | LNU916    | 0.753 | 1.92E-02 | 1       | 21             |
| LNU917                                                                                                                                                                                                                      | 0.750 | 1.25E-02 | 6       | 17             | LNU917    | 0.728 | 1.70E-02 | 6       | 44             |
| LNU917                                                                                                                                                                                                                      | 0.900 | 3.94E-04 | 4       | 53             | LNU917    | 0.794 | 6.13E-03 | 4       | 4              |
| LNU917                                                                                                                                                                                                                      | 0.904 | 3.29E-04 | 4       | 12             | LNU917    | 0.959 | 4.46E-05 | 3       | 52             |
| LNU917                                                                                                                                                                                                                      | 0.830 | 2.97E-03 | 3       | 6              | LNU917    | 0.925 | 3.50E-04 | 3       | 49             |
| LNU917                                                                                                                                                                                                                      | 0.804 | 5.09E-03 | 3       | 8              | LNU917    | 0.728 | 2.62E-02 | 1       | 18             |
| LNU918                                                                                                                                                                                                                      | 0.837 | 2.54E-03 | 9       | 17             | LNU918    | 0.757 | 1.13E-02 | 8       | 16             |
| LNU918                                                                                                                                                                                                                      | 0.748 | 1.29E-02 | 3       | 44             | LNU919    | 0.791 | 6.48E-03 | 9       | 17             |
| LNU919                                                                                                                                                                                                                      | 0.756 | 1.14E-02 | 9       | 40             | LNU919    | 0.758 | 1.11E-02 | 9       | 44             |
| LNU919                                                                                                                                                                                                                      | 0.758 | 1.10E-02 | 9       | 43             | LNU919    | 0.709 | 2.16E-02 | 9       | 34             |
| LNU919                                                                                                                                                                                                                      | 0.896 | 4.55E-04 | 2       | 41             | LNU919    | 0.733 | 1.59E-02 | 2       | 22             |
| LNU919                                                                                                                                                                                                                      | 0.736 | 1.52E-02 | 2       | 42             | LNU919    | 0.836 | 2.56E-03 | 2       | 51             |
| LNU919                                                                                                                                                                                                                      | 0.780 | 7.74E-03 | 2       | 37             | LNU919    | 0.769 | 9.37E-03 | 2       | 16             |
| LNU919                                                                                                                                                                                                                      | 0.870 | 1.05E-03 | 8       | 35             | LNU919    | 0.708 | 2.19E-02 | 3       | 17             |
| LNU920                                                                                                                                                                                                                      | 0.728 | 1.71E-02 | 6       | 14             | LNU920    | 0.727 | 1.72E-02 | 6       | 49             |
| LNU920                                                                                                                                                                                                                      | 0.790 | 1.12E-02 | 4       | 45             | LNU921    | 0.701 | 2.40E-02 | 6       | 17             |
| LNU921                                                                                                                                                                                                                      | 0.876 | 8.95E-04 | 4       | 53             | LNU921    | 0.804 | 5.05E-03 | 4       | 4              |
| LNU921                                                                                                                                                                                                                      | 0.867 | 1.16E-03 | 4       | 12             | LNU922    | 0.819 | 3.73E-03 | 6       | 3              |
| LNU922                                                                                                                                                                                                                      | 0.740 | 1.44E-02 | 2       | 37             | LNU922    | 0.796 | 5.83E-03 | 2       | 16             |
| LNU922                                                                                                                                                                                                                      | 0.779 | 7.87E-03 | 5       | 2              | LNU922    | 0.701 | 2.39E-02 | 3       | 20             |
| LNU922                                                                                                                                                                                                                      | 0.820 | 6.77E-03 | 1       | 18             | LNU922    | 0.864 | 2.66E-03 | 1       | 24             |
| LNU922                                                                                                                                                                                                                      | 0.886 | 1.47E-03 | 1       | 21             | LNU923    | 0.785 | 7.10E-03 | 6       | 48             |
| LNU923                                                                                                                                                                                                                      | 0.734 | 1.56E-02 | 5       | 2              | LNU923    | 0.897 | 4.27E-04 | 3       | 17             |
| LNU923                                                                                                                                                                                                                      | 0.714 | 2.03E-02 | 3       | 44             | LNU924    | 0.824 | 3.39E-03 | 9       | 17             |
| LNU924                                                                                                                                                                                                                      | 0.746 | 1.32E-02 | 9       | 23             | LNU924    | 0.734 | 1.56E-02 | 9       | 44             |
| LNU924                                                                                                                                                                                                                      | 0.803 | 5.20E-03 | 4       | 53             | LNU924    | 0.820 | 3.66E-03 | 4       | 4              |
| LNU924                                                                                                                                                                                                                      | 0.808 | 4.66E-03 | 4       | 12             | LNU924    | 0.702 | 2.36E-02 | 8       | 33             |
| LNU924                                                                                                                                                                                                                      | 0.723 | 1.81E-02 | 8       | 35             | LNU925    | 0.715 | 2.00E-02 | 6       | 11             |
| LNU925                                                                                                                                                                                                                      | 0.737 | 1.49E-02 | 6       | 6              | LNU925    | 0.701 | 2.38E-02 | 6       | 14             |
| LNU925                                                                                                                                                                                                                      | 0.782 | 7.53E-03 | 2       | 5              | LNU925    | 0.716 | 1.98E-02 | 2       | 50             |
| LNU925                                                                                                                                                                                                                      | 0.737 | 1.51E-02 | 2       | 54             | LNU925    | 0.765 | 9.87E-03 | 2       | 41             |
| LNU925                                                                                                                                                                                                                      | 0.710 | 2.14E-02 | 2       | 10             | LNU925    | 0.785 | 7.18E-03 | 2       | 28             |

TABLE 36-continued

| Correlation between the expression level of selected genes of some embodiments of the invention<br>in various tissues and the phenotypic performance under normal or abiotic stress conditions<br>across Sorghum accessions |       |          |         |                |           |       |          |         |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|---------|----------------|-----------|-------|----------|---------|----------------|
| Gene Name                                                                                                                                                                                                                   | R     | P value  | Exp.set | Cor.<br>Set ID | Gene Name | R     | P value  | Exp.set | Cor.<br>Set ID |
| LNU925                                                                                                                                                                                                                      | 0.717 | 1.95E-02 | 2       | 13             | LNU925    | 0.752 | 1.22E-02 | 2       | 51             |
| LNU925                                                                                                                                                                                                                      | 0.761 | 1.05E-02 | 2       | 37             | LNU925    | 0.734 | 1.56E-02 | 4       | 53             |
| LNU925                                                                                                                                                                                                                      | 0.751 | 1.22E-02 | 4       | 12             | LNU925    | 0.824 | 3.40E-03 | 8       | 41             |
| LNU925                                                                                                                                                                                                                      | 0.787 | 6.84E-03 | 8       | 51             | LNU925    | 0.770 | 9.16E-03 | 8       | 37             |
| LNU925                                                                                                                                                                                                                      | 0.814 | 4.16E-03 | 8       | 16             | LNU925    | 0.825 | 6.15E-03 | 3       | 52             |
| LNU925                                                                                                                                                                                                                      | 0.711 | 2.13E-02 | 3       | 6              | LNU925    | 0.762 | 1.71E-0  | 3       | 49             |
| LNU925                                                                                                                                                                                                                      | 0.817 | 3.91E-03 | 3       | 8              | LNU926    | 0.823 | 3.43E-03 | 6       | 17             |
| LNU926                                                                                                                                                                                                                      | 0.706 | 2.26E-02 | 6       | 43             | LNU926    | 0.778 | 8.05E-03 | 8       | 2              |
| LNU926                                                                                                                                                                                                                      | 0.715 | 2.02E-02 | 7       | 30             | LNU928    | 0.840 | 4.57E-03 | 4       | 45             |
| LNU928                                                                                                                                                                                                                      | 0.733 | 2.47E-02 | 3       | 52             | LNU928    | 0.793 | 1.08E-02 | 3       | 49             |
| LNU928                                                                                                                                                                                                                      | 0.712 | 3.13E-02 | 7       | 45             | LNU928    | 0.855 | 1.60E-03 | 1       | 15             |
| LNU930                                                                                                                                                                                                                      | 0.754 | 1.18E-02 | 9       | 11             | LNU930    | 0.748 | 1.28E-02 | 2       | 41             |
| LNU930                                                                                                                                                                                                                      | 0.714 | 2.03E-02 | 2       | 35             | LNU930    | 0.757 | 1.13E-02 | 2       | 42             |
| LNU930                                                                                                                                                                                                                      | 0.748 | 1.29E-02 | 2       | 51             | LNU930    | 0.733 | 1.60E-02 | 2       | 37             |
| LNU930                                                                                                                                                                                                                      | 0.702 | 2.35E-02 | 2       | 16             | LNU930    | 0.774 | 1.45E-02 | 3       | 52             |
| LNU930                                                                                                                                                                                                                      | 0.767 | 1.59E-02 | 3       | 49             | LNU931    | 0.834 | 2.72E-03 | 6       | 3              |
| LNU931                                                                                                                                                                                                                      | 0.797 | 5.77E-03 | 8       | 41             | LNU931    | 0.795 | 5.99E-03 | 8       | 35             |
| LNU931                                                                                                                                                                                                                      | 0.836 | 2.60E-03 | 8       | 42             | LNU931    | 0.836 | 2.60E-03 | 8       | 51             |
| LNU931                                                                                                                                                                                                                      | 0.859 | 1.44E-03 | 8       | 37             | LNU931    | 0.709 | 2.16E-02 | 5       | 2              |
| LNU932                                                                                                                                                                                                                      | 0.829 | 5.69E-03 | 3       | 55             | LNU932    | 0.703 | 3.47E-02 | 7       | 18             |
| LNU932                                                                                                                                                                                                                      | 0.799 | 9.81E-03 | 7       | 27             | LNU932    | 0.729 | 2.58E-02 | 7       | 24             |
| LNU933                                                                                                                                                                                                                      | 0.771 | 9.00E-03 | 5       | 2              | LNU933    | 0.778 | 8.03E-03 | 1       | 30             |
| LNU934                                                                                                                                                                                                                      | 0.834 | 2.71E-03 | 6       | 48             | LNU934    | 0.868 | 1.13E-03 | 9       | 43             |
| LNU934                                                                                                                                                                                                                      | 0.711 | 2.10E-02 | 2       | 41             | LNU934    | 0.755 | 1.16E-02 | 2       | 51             |
| LNU934                                                                                                                                                                                                                      | 0.757 | 1.12E-02 | 2       | 37             | LNU934    | 0.716 | 1.98E-02 | 3       | 17             |
| LNU934                                                                                                                                                                                                                      | 0.897 | 4.31E-04 | 3       | 44             | LNU935    | 0.739 | 1.46E-02 | 6       | 17             |
| LNU935                                                                                                                                                                                                                      | 0.781 | 7.62E-03 | 9       | 17             | LNU935    | 0.765 | 1.62E-02 | 3       | 55             |
| LNU935                                                                                                                                                                                                                      | 0.927 | 3.22E-04 | 1       | 18             | LNU935    | 0.815 | 7.47E-03 | 1       | 27             |
| LNU935                                                                                                                                                                                                                      | 0.871 | 2.21E-03 | 1       | 24             | LNU935    | 0.735 | 2.42E-02 | 1       | 21             |
| LNU936                                                                                                                                                                                                                      | 0.739 | 1.46E-02 | 6       | 36             | LNU936    | 0.735 | 1.55E-02 | 6       | 34             |
| LNU936                                                                                                                                                                                                                      | 0.786 | 7.01E-03 | 2       | 42             | LNU936    | 0.734 | 1.56E-02 | 8       | 16             |
| LNU938                                                                                                                                                                                                                      | 0.743 | 1.39E-02 | 9       | 17             | LNU938    | 0.847 | 2.00E-03 | 9       | 44             |
| LNU938                                                                                                                                                                                                                      | 0.836 | 2.57E-03 | 4       | 30             | LNU939    | 0.830 | 2.95E-03 | 4       | 53             |
| LNU939                                                                                                                                                                                                                      | 0.777 | 8.25E-03 | 4       | 4              | LNU939    | 0.830 | 2.98E-03 | 4       | 12             |
| LNU939                                                                                                                                                                                                                      | 0.821 | 3.56E-03 | 5       | 5              | LNU939    | 0.821 | 3.60E-03 | 5       | 50             |
| LNU939                                                                                                                                                                                                                      | 0.869 | 1.11E-03 | 5       | 54             | LNU939    | 0.900 | 3.91E-04 | 5       | 13             |
| LNU939                                                                                                                                                                                                                      | 0.954 | 6.53E-05 | 7       | 18             | LNU939    | 0.894 | 1.15E-03 | 7       | 27             |
| LNU939                                                                                                                                                                                                                      | 0.904 | 8.15E-04 | 7       | 24             | LNU940    | 0.784 | 7.31E-03 | 6       | 6              |
| LNU940                                                                                                                                                                                                                      | 0.762 | 1.04E-02 | 6       | 40             | LNU940    | 0.748 | 1.29E-02 | 6       | 14             |
| LNU940                                                                                                                                                                                                                      | 0.730 | 1.64E-02 | 6       | 34             | LNU940    | 0.718 | 2.95E-02 | 9       | 52             |
| LNU940                                                                                                                                                                                                                      | 0.841 | 2.28E-03 | 9       | 6              | LNU940    | 0.715 | 2.02E-02 | 9       | 14             |
| LNU940                                                                                                                                                                                                                      | 0.713 | 2.05E-02 | 5       | 5              | LNU940    | 0.721 | 1.86E-02 | 5       | 54             |
| LNU940                                                                                                                                                                                                                      | 0.767 | 9.62E-03 | 5       | 13             | LNU941    | 0.893 | 5.02E-04 | 2       | 41             |
| LNU941                                                                                                                                                                                                                      | 0.753 | 1.20E-02 | 2       | 22             | LNU941    | 0.741 | 1.42E-02 | 2       | 35             |
| LNU941                                                                                                                                                                                                                      | 0.721 | 1.87E-02 | 2       | 42             | LNU941    | 0.891 | 5.44E-04 | 2       | 51             |
| LNU941                                                                                                                                                                                                                      | 0.824 | 3.37E-03 | 2       | 37             | LNU941    | 0.857 | 1.52E-03 | 3       | 6              |
| LNU942                                                                                                                                                                                                                      | 0.716 | 1.99E-02 | 9       | 17             | LNU942    | 0.786 | 6.97E-03 | 2       | 41             |
| LNU942                                                                                                                                                                                                                      | 0.737 | 1.50E-02 | 2       | 22             | LNU942    | 0.740 | 1.43E-02 | 2       | 51             |
| LNU942                                                                                                                                                                                                                      | 0.839 | 2.43E-03 | 4       | 53             | LNU942    | 0.829 | 3.01E-03 | 4       | 4              |
| LNU942                                                                                                                                                                                                                      | 0.846 | 2.01E-03 | 4       | 12             | LNU942    | 0.895 | 4.67E-04 | 8       | 31             |
| LNU942                                                                                                                                                                                                                      | 0.885 | 1.52E-03 | 3       | 52             | LNU942    | 0.884 | 1.56E-03 | 3       | 49             |
| LNU942                                                                                                                                                                                                                      | 0.771 | 9.09E-03 | 1       | 53             | LNU942    | 0.792 | 6.32E-03 | 1       | 4              |
| LNU942                                                                                                                                                                                                                      | 0.761 | 1.06E-02 | 1       | 12             | LNU943    | 0.720 | 1.88E-02 | 6       | 17             |
| LNU943                                                                                                                                                                                                                      | 0.766 | 9.80E-03 | 5       | 19             | LNU943    | 0.773 | 8.75E-03 | 5       | 28             |
| LNU943                                                                                                                                                                                                                      | 0.701 | 2.38E-02 | 5       | 13             | LNU944    | 0.803 | 5.12E-03 | 6       | 26             |
| LNU944                                                                                                                                                                                                                      | 0.861 | 1.38E-03 | 6       | 20             | LNU944    | 0.805 | 4.92E-03 | 6       | 23             |
| LNU944                                                                                                                                                                                                                      | 0.718 | 1.95E-02 | 6       | 44             | LNU944    | 0.804 | 5.03E-03 | 2       | 28             |
| LNU944                                                                                                                                                                                                                      | 0.750 | 1.25E-02 | 8       | 47             | LNU944    | 0.795 | 1.05E-02 | 3       | 52             |
| LNU944                                                                                                                                                                                                                      | 0.747 | 2.08E-02 | 3       | 49             | LNU944    | 0.752 | 1.22E-02 | 3       | 8              |
| LNU945                                                                                                                                                                                                                      | 0.703 | 2.34E-02 | 6       | 14             | LNU945    | 0.813 | 4.27E-03 | 2       | 47             |
| LNU945                                                                                                                                                                                                                      | 0.805 | 4.92E-03 | 8       | 35             | LNU946    | 0.791 | 6.43E-03 | 6       | 17             |
| LNU946                                                                                                                                                                                                                      | 0.795 | 5.99E-03 | 6       | 44             | LNU946    | 0.898 | 4.26E-04 | 5       | 16             |
| LNU946                                                                                                                                                                                                                      | 0.745 | 1.34E-02 | 3       | 23             | LNU946    | 0.867 | 2.49E-03 | 7       | 18             |
| LNU946                                                                                                                                                                                                                      | 0.899 | 9.92E-04 | 7       | 27             | LNU946    | 0.796 | 1.02E-02 | 7       | 24             |
| LNU947                                                                                                                                                                                                                      | 0.736 | 1.52E-02 | 9       | 40             | LNU947    | 0.741 | 1.41E-02 | 9       | 34             |
| LNU947                                                                                                                                                                                                                      | 0.717 | 1.96E-02 | 1       | 53             | LNU947    | 0.847 | 1.98E-03 | 1       | 4              |
| LNU947                                                                                                                                                                                                                      | 0.705 | 2.29E-02 | 1       | 12             | LNU948    | 0.780 | 7.76E-03 | 6       | 48             |
| LNU948                                                                                                                                                                                                                      | 0.710 | 2.15E-02 | 6       | 3              | LNU948    | 0.705 | 2.27E-02 | 1       | 30             |
| LNU949                                                                                                                                                                                                                      | 0.751 | 1.23E-02 | 6       | 52             | LNU949    | 0.800 | 5.48E-03 | 6       | 11             |
| LNU949                                                                                                                                                                                                                      | 0.834 | 2.72E-03 | 6       | 6              | LNU949    | 0.736 | 1.52E-02 | 6       | 14             |
| LNU949                                                                                                                                                                                                                      | 0.758 | 1.11E-02 | 6       | 49             | LNU949    | 0.730 | 1.66E-02 | 2       | 47             |
| LNU949                                                                                                                                                                                                                      | 0.764 | 1.01E-02 | 4       | 53             | LNU949    | 0.843 | 2.17E-03 | 4       | 4              |
| LNU949                                                                                                                                                                                                                      | 0.756 | 1.14E-02 | 4       | 12             | LNU949    | 0.795 | 6.00E-03 | 5       | 5              |

TABLE 36-continued

| Correlation between the expression level of selected genes of some embodiments of the invention<br>in various tissues and the phenotypic performance under normal or abiotic stress conditions<br>across Sorghum accessions |       |          |         |                |           |       |          |         |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|---------|----------------|-----------|-------|----------|---------|----------------|
| Gene Name                                                                                                                                                                                                                   | R     | P value  | Exp.set | Cor.<br>Set ID | Gene Name | R     | P value  | Exp.set | Cor.<br>Set ID |
| LNU949                                                                                                                                                                                                                      | 0.805 | 4.96E-03 | 5       | 50             | LNU949    | 0.780 | 7.77E-03 | 5       | 54             |
| LNU949                                                                                                                                                                                                                      | 0.799 | 5.56E-03 | 5       | 13             | LNU949    | 0.758 | 1.11E-02 | 3       | 8              |
| LNU950                                                                                                                                                                                                                      | 0.739 | 1.47E-02 | 6       | 3              | LNU951    | 0.744 | 1.37E-02 | 2       | 13             |
| LNU952                                                                                                                                                                                                                      | 0.838 | 4.78E-03 | 3       | 52             | LNU952    | 0.870 | 1.07E-03 | 3       | 6              |
| LNU952                                                                                                                                                                                                                      | 0.776 | 1.39E-02 | 3       | 49             | LNU952    | 0.796 | 5.90E-03 | 3       | 8              |
| LNU952                                                                                                                                                                                                                      | 0.785 | 1.21E-02 | 1       | 45             | LNU952    | 0.786 | 7.02E-03 | 1       | 53             |
| LNU952                                                                                                                                                                                                                      | 0.728 | 1.70E-02 | 1       | 4              | LNU952    | 0.774 | 8.66E-03 | 1       | 12             |
| LNU953                                                                                                                                                                                                                      | 0.774 | 1.44E-02 | 3       | 52             | LNU953    | 0.771 | 1.51E-02 | 3       | 49             |
| LNU953                                                                                                                                                                                                                      | 0.726 | 1.74E-02 | 3       | 8              | LNU954    | 0.814 | 4.13E-03 | 6       | 52             |
| LNU954                                                                                                                                                                                                                      | 0.715 | 2.02E-02 | 6       | 14             | LNU954    | 0.793 | 6.19E-03 | 6       | 49             |
| LNU954                                                                                                                                                                                                                      | 0.726 | 2.69E-02 | 4       | 45             | LNU954    | 0.860 | 1.42E-03 | 8       | 5              |
| LNU954                                                                                                                                                                                                                      | 0.861 | 1.36E-03 | 8       | 50             | LNU954    | 0.851 | 1.79E-03 | 8       | 54             |
| LNU954                                                                                                                                                                                                                      | 0.739 | 1.46E-02 | 8       | 10             | LNU954    | 0.871 | 1.04E-03 | 8       | 35             |
| LNU954                                                                                                                                                                                                                      | 0.782 | 7.52E-03 | 8       | 13             | LNU954    | 0.802 | 5.29E-03 | 5       | 5              |
| LNU954                                                                                                                                                                                                                      | 0.774 | 8.55E-03 | 5       | 54             | LNU954    | 0.762 | 1.04E-02 | 5       | 10             |
| LNU954                                                                                                                                                                                                                      | 0.750 | 2.00E-02 | 7       | 18             | LNU954    | 0.730 | 2.57E-02 | 7       | 24             |
| LNU955                                                                                                                                                                                                                      | 0.732 | 1.61E-02 | 9       | 17             | LNU955    | 0.805 | 8.86E-03 | 4       | 18             |
| LNU955                                                                                                                                                                                                                      | 0.812 | 7.90E-03 | 4       | 27             | LNU955    | 0.728 | 2.63E-02 | 4       | 24             |
| LNU955                                                                                                                                                                                                                      | 0.824 | 3.40E-03 | 8       | 33             | LNU955    | 0.851 | 1.80E-03 | 8       | 39             |
| LNU955                                                                                                                                                                                                                      | 0.705 | 2.27E-02 | 5       | 2              | LNU955    | 0.710 | 2.15E-02 | 1       | 30             |
| LNU956                                                                                                                                                                                                                      | 0.786 | 1.21E-02 | 4       | 45             | LNU956    | 0.787 | 1.19E-02 | 1       | 45             |
| LNU957                                                                                                                                                                                                                      | 0.749 | 1.27E-02 | 6       | 29             | LNU957    | 0.743 | 1.37E-02 | 6       | 20             |
| LNU957                                                                                                                                                                                                                      | 0.782 | 1.27E-02 | 3       | 55             | LNU958    | 0.801 | 5.37E-03 | 9       | 17             |
| LNU958                                                                                                                                                                                                                      | 0.773 | 8.77E-03 | 4       | 30             | LNU958    | 0.800 | 5.47E-03 | 8       | 33             |
| LNU958                                                                                                                                                                                                                      | 0.799 | 5.53E-03 | 8       | 39             | LNU958    | 0.759 | 1.09E-02 | 8       | 16             |
| LNU958                                                                                                                                                                                                                      | 0.720 | 1.88E-02 | 5       | 41             | LNU958    | 0.886 | 6.41E-04 | 5       | 16             |
| LNU959                                                                                                                                                                                                                      | 0.827 | 3.13E-03 | 2       | 41             | LNU959    | 0.747 | 1.29E-02 | 2       | 22             |
| LNU959                                                                                                                                                                                                                      | 0.757 | 1.13E-02 | 2       | 51             | LNU959    | 0.778 | 8.02E-03 | 2       | 16             |
| LNU959                                                                                                                                                                                                                      | 0.727 | 1.72E-02 | 4       | 9              | LNU959    | 0.928 | 3.02E-04 | 3       | 52             |
| LNU959                                                                                                                                                                                                                      | 0.871 | 1.03E-03 | 3       | 6              | LNU959    | 0.701 | 2.39E-02 | 3       | 14             |
| LNU959                                                                                                                                                                                                                      | 0.893 | 1.17E-03 | 3       | 49             | LNU959    | 0.771 | 8.97E-03 | 3       | 8              |
| LNU960                                                                                                                                                                                                                      | 0.865 | 1.23E-03 | 6       | 17             | LNU960    | 0.886 | 6.43E-04 | 6       | 44             |
| LNU960                                                                                                                                                                                                                      | 0.771 | 9.08E-03 | 9       | 26             | LNU960    | 0.807 | 4.82E-03 | 9       | 23             |
| LNU960                                                                                                                                                                                                                      | 0.722 | 1.83E-02 | 9       | 44             | LNU960    | 0.754 | 1.17E-02 | 2       | 42             |
| LNU960                                                                                                                                                                                                                      | 0.759 | 1.10E-02 | 2       | 37             | LNU960    | 0.932 | 8.55E-05 | 4       | 53             |
| LNU960                                                                                                                                                                                                                      | 0.870 | 1.05E-03 | 4       | 4              | LNU960    | 0.932 | 8.83E-05 | 4       | 12             |
| LNU960                                                                                                                                                                                                                      | 0.738 | 1.49E-02 | 5       | 13             | LNU960    | 0.703 | 2.34E-02 | 5       | 51             |
| LNU961                                                                                                                                                                                                                      | 0.738 | 1.47E-02 | 6       | 20             | LNU961    | 0.803 | 5.15E-03 | 9       | 17             |
| LNU961                                                                                                                                                                                                                      | 0.836 | 2.56E-03 | 9       | 44             | LNU961    | 0.735 | 1.54E-02 | 9       | 43             |
| LNU961                                                                                                                                                                                                                      | 0.745 | 1.35E-02 | 8       | 33             | LNU961    | 0.824 | 3.40E-03 | 8       | 35             |
| LNU961                                                                                                                                                                                                                      | 0.781 | 7.62E-03 | 3       | 8              | LNU961    | 0.874 | 2.06E-03 | 7       | 18             |
| LNU961                                                                                                                                                                                                                      | 0.954 | 6.50E-05 | 7       | 27             | LNU961    | 0.789 | 1.14E-02 | 7       | 24             |
| LNU962                                                                                                                                                                                                                      | 0.808 | 4.66E-03 | 2       | 16             | LNU962    | 0.725 | 1.76E-02 | 5       | 28             |
| LNU962                                                                                                                                                                                                                      | 0.897 | 1.06E-03 | 3       | 52             | LNU962    | 0.848 | 1.93E-03 | 3       | 6              |
| LNU962                                                                                                                                                                                                                      | 0.892 | 1.22E-03 | 3       | 49             | LNU962    | 0.706 | 3.36E-02 | 1       | 45             |
| LNU964                                                                                                                                                                                                                      | 0.706 | 2.24E-02 | 2       | 33             | LNU964    | 0.778 | 8.03E-03 | 2       | 41             |
| LNU964                                                                                                                                                                                                                      | 0.756 | 1.14E-02 | 2       | 35             | LNU964    | 0.820 | 3.71E-03 | 2       | 51             |
| LNU964                                                                                                                                                                                                                      | 0.820 | 3.71E-03 | 2       | 37             | LNU964    | 0.778 | 8.06E-03 | 3       | 44             |
| LNU964                                                                                                                                                                                                                      | 0.713 | 2.06E-02 | 1       | 53             | LNU964    | 0.712 | 2.08E-02 | 1       | 12             |
| LNU965                                                                                                                                                                                                                      | 0.828 | 3.08E-03 | 6       | 48             | LNU965    | 0.745 | 1.35E-02 | 6       | 3              |
| LNU965                                                                                                                                                                                                                      | 0.779 | 7.92E-03 | 2       | 33             | LNU965    | 0.885 | 6.71E-04 | 2       | 41             |
| LNU965                                                                                                                                                                                                                      | 0.767 | 9.59E-03 | 2       | 39             | LNU965    | 0.829 | 3.04E-03 | 2       | 51             |
| LNU965                                                                                                                                                                                                                      | 0.861 | 1.39E-03 | 2       | 37             | LNU965    | 0.875 | 9.24E-04 | 2       | 16             |
| LNU966                                                                                                                                                                                                                      | 0.709 | 2.17E-02 | 6       | 52             | LNU966    | 0.708 | 2.20E-02 | 6       | 3              |
| LNU966                                                                                                                                                                                                                      | 0.748 | 1.29E-02 | 3       | 6              | LNU966    | 0.716 | 3.00E-02 | 7       | 45             |
| LNU967                                                                                                                                                                                                                      | 0.800 | 5.48E-03 | 6       | 17             | LNU967    | 0.766 | 9.82E-03 | 4       | 53             |
| LNU967                                                                                                                                                                                                                      | 0.707 | 2.22E-02 | 4       | 4              | LNU967    | 0.768 | 9.41E-03 | 4       | 12             |
| LNU968                                                                                                                                                                                                                      | 0.771 | 9.02E-03 | 6       | 48             | LNU968    | 0.719 | 1.90E-02 | 2       | 33             |
| LNU968                                                                                                                                                                                                                      | 0.919 | 1.71E-04 | 2       | 41             | LNU968    | 0.904 | 3.35E-04 | 2       | 51             |
| LNU968                                                                                                                                                                                                                      | 0.781 | 7.72E-03 | 2       | 37             | LNU968    | 0.734 | 1.56E-02 | 2       | 16             |
| LNU968                                                                                                                                                                                                                      | 0.788 | 6.83E-03 | 3       | 17             | LNU968    | 0.826 | 3.22E-03 | 3       | 43             |
| LNU969                                                                                                                                                                                                                      | 0.805 | 4.95E-03 | 2       | 42             |           |       |          |         |                |

Table 36: Provided are the correlations (R) between the expression levels of yield improving genes and their homologues in tissues [Flag leaf, Flower meristem, stem and Flower; Expression sets (Exp)] and the phenotypic performance in various yield, biomass, growth rate and/or vigor components [Correlation vector (cor.)] under stress conditions or normal conditions across Sorghum accessions. P = p value.

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## Example 6

Production of *Sorghum* Transcriptom and High Throughput Correlation Analysis with Biomass, NUE, and ABST Related Parameters Measured in Semi-Hydroponics Conditions Using 44K Sorghum Oligonucleotide Micro-Arrays

*Sorghum* vigor related parameters under low nitrogen, 100 mM NaCl, low temperature ( $10 \pm 2^\circ \text{C}$ .) and normal growth conditions—Ten *Sorghum* hybrids were grown in 3 repetitive plots, each containing 17 plants, at a net house under semi-hydroponics conditions. Briefly, the growing protocol was as follows: *Sorghum* seeds were sown in trays filled with a mix of vermiculite and peat in a 1:1 ratio. Following germination, the trays were transferred to the high salinity solution (100 mM NaCl in addition to the Full Hoagland solution), low temperature ( $10 \pm 2^\circ \text{C}$  in the presence of Full Hoagland solution), low nitrogen solution (the amount of total nitrogen was reduced in 90% from the full Hoagland solution (i.e., to a final concentration of 10% from full Hoagland solution, final amount of 1.2 mM N) or at Normal growth solution (Full Hoagland containing 16 mM N solution, at  $28 \pm 2^\circ \text{C}$ .) Plants were grown at  $28 \pm 2^\circ \text{C}$ .

Full Hoagland solution consists of:  $\text{KNO}_3$ —0.808 grams/liter,  $\text{MgSO}_4$ —0.12 grams/liter,  $\text{KH}_2\text{PO}_4$ —0.172 grams/liter and 0.01% (volume/volume) of ‘Super coratin’ micro elements (Iron-EDDHA [ethylenediamine-N,N'-bis(2-hydroxyphenylacetic acid)]—40.5 grams/liter; Mn—20.2 grams/liter; Zn 10.1 grams/liter; Co 1.5 grams/liter; and Mo 1.1 grams/liter), solution's pH should be 6.5-6.8].

Analyzed *Sorghum* tissues—All 10 selected *Sorghum* hybrids were sampled per each treatment. Three tissues [leaves, meristems and roots] growing at 100 mM NaCl, low temperature ( $10 \pm 2^\circ \text{C}$ .), low Nitrogen (1.2 mM N) or under Normal conditions were sampled and RNA was extracted as described above. Each micro-array expression information tissue type has received a Set ID as summarized in Table 37 below.

TABLE 37

| Sorghum transcriptom expression sets under semi hydroponics conditions |                                               |
|------------------------------------------------------------------------|-----------------------------------------------|
| Set ID                                                                 | Expression Set                                |
| 1                                                                      | Sorghum root under cold                       |
| 2                                                                      | Sorghum root under normal conditions          |
| 3                                                                      | Sorghum root under low N conditions           |
| 4                                                                      | Sorghum root under 100 mM NaCl conditions     |
| 5                                                                      | Sorghum meristem under cold                   |
| 6                                                                      | Sorghum meristem under normal conditions      |
| 7                                                                      | Sorghum meristem under low N conditions       |
| 8                                                                      | Sorghum meristem under 100 mM NaCl conditions |

Table 37: Provided are the Sorghum transcriptom expression sets.

Cold conditions =  $10 \pm 2^\circ \text{C}$ ;

NaCl = 100 mM NaCl;

low nitrogen = 1.2 mM Nitrogen;

Normal conditions = 16 mM Nitrogen.

## Experimental Results

10 different *Sorghum* hybrids were grown and characterized for the following parameters: “Leaf No”=leaf number per plant (average of five plants); “Plant Height”=plant height [cm] (average of five plants); “DW Root/Plant”—root dry weight per plant (average of five plants); DW Shoot/Plant—shoot dry weight per plant (average of five plants) (Table 38). The average for each of the measured parameter was calculated using the JMP software and values are summarized in Tables 39-45 below. Subsequent correlation analysis was performed (Table 46). Results were then integrated to the database.

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TABLE 38

| Sorghum correlated parameters (vectors) |                                                          |
|-----------------------------------------|----------------------------------------------------------|
| Correlation ID                          | Correlated parameter with                                |
| 1                                       | DW Root/Plant-100 mM NaCl [gr.]                          |
| 2                                       | DW Root/Plant-Cold [gr.]                                 |
| 3                                       | DW Root/Plant-Low Nitrogen [gr.]                         |
| 4                                       | DW Root/Plant-Normal [gr.]                               |
| 5                                       | DW Shoot/Plant-Low Nitrogen [gr.]                        |
| 6                                       | DW Shoot/Plant-100 mM NaCl [gr.]                         |
| 7                                       | DW Shoot/Plant-Cold [gr.]                                |
| 8                                       | DW Shoot/Plant-Normal [gr.]                              |
| 9                                       | Leaf TP1-100 mM NaCl [number]                            |
| 10                                      | Leaf TP1-Cold [number]                                   |
| 11                                      | Leaf TP1-Low Nitrogen [number]                           |
| 12                                      | Leaf TP1-Normal [number]                                 |
| 13                                      | Leaf TP2-100 mM NaCl [number]                            |
| 14                                      | Leaf TP2-Cold [number]                                   |
| 15                                      | Leaf TP2-Low Nitrogen [number]                           |
| 16                                      | Leaf TP2-Normal [number]                                 |
| 17                                      | Leaf TP3-100 mM NaCl [number]                            |
| 18                                      | Leaf TP3-Cold [number]                                   |
| 19                                      | Leaf TP3-Low Nitrogen [number]                           |
| 20                                      | Leaf TP3-Normal [number]                                 |
| 21                                      | Low N-NUE total biomass [gr.]                            |
| 22                                      | Low N-Shoot/Root                                         |
| 23                                      | Low N-NUE roots                                          |
| 24                                      | Low N-NUE shoots                                         |
| 25                                      | Low N-percent-root biomass compared to normal            |
| 26                                      | Low N-percent-shoot biomass compared to normal           |
| 27                                      | Low N-percent-total biomass reduction compared to normal |
| 28                                      | N level/Leaf [Low Nitrogen]                              |
| 29                                      | N level/Leaf [100 mM NaCl]                               |
| 30                                      | N level/Leaf [Cold]                                      |
| 31                                      | N level/Leaf [Normal]                                    |
| 32                                      | Normal-Shoot/Root                                        |
| 33                                      | Normal-NUE roots                                         |
| 34                                      | Normal-NUE shoots                                        |
| 35                                      | Normal-NUE total biomass                                 |
| 36                                      | Plant Height TP1-100 mM NaCl [cm]                        |
| 37                                      | Plant Height TP1-Cold [cm]                               |
| 38                                      | Plant Height TP1-Low Nitrogen [cm]                       |
| 39                                      | Plant Height TP1-Normal [cm]                             |
| 40                                      | Plant Height TP2-Cold [cm]                               |
| 41                                      | Plant Height TP2-Low Nitrogen [cm]                       |
| 42                                      | Plant Height TP2-Normal [cm]                             |
| 43                                      | Plant Height TP2-100 mM NaCl [cm]                        |
| 44                                      | Plant Height TP3-100 mM NaCl [cm]                        |
| 45                                      | Plant Height TP3-Low Nitrogen [cm]                       |
| 46                                      | RGR Leaf Num Normal                                      |
| 47                                      | Root Biomass [DW-gr.]/SPAD [100 mM NaCl]                 |
| 48                                      | Root Biomass [DW-gr.]/SPAD [Cold]                        |
| 49                                      | Root Biomass [DW-gr.]/SPAD [Low Nitrogen]                |
| 50                                      | Root Biomass [DW-gr.]/SPAD [Normal]                      |
| 51                                      | SPAD-Cold                                                |
| 52                                      | SPAD-Low Nitrogen                                        |
| 53                                      | SPAD-Normal                                              |
| 54                                      | SPAD 100-mM NaCl                                         |
| 55                                      | Shoot Biomass [DW-gr.]/SPAD [100 mM NaCl]                |
| 56                                      | Shoot Biomass [DW-gr.]/SPAD [Cold]                       |
| 57                                      | Shoot Biomass [DW-gr.]/SPAD [Low Nitrogen]               |
| 58                                      | Shoot Biomass [DW-gr.]/SPAD [Normal]                     |
| 59                                      | Total Biomass-Root + Shoot [DW-gr.]/SPAD [100 mM NaCl]   |
| 60                                      | Total Biomass-Root + Shoot [DW-gr.]/SPAD [Cold]          |
| 61                                      | Total Biomass-Root + Shoot [DW-gr.]/SPAD [Low Nitrogen]  |
| 62                                      | Total Biomass-Root + Shoot [DW-gr.]/SPAD [Normal]        |

Table 38: Provided are the Sorghum correlated parameters.

Cold conditions =  $10 \pm 2^\circ \text{C}$ ;

NaCl = 100 mM NaCl;

low nitrogen = 1.2 mM Nitrogen;

Normal conditions = 16 mM Nitrogen

\* TP-1-2-3 refers to time points 1, 2 and 3.

TABLE 39

| Sorghum accessions, measured parameters under low nitrogen growth conditions |      |      |      |      |      |       |       |       |       |      |
|------------------------------------------------------------------------------|------|------|------|------|------|-------|-------|-------|-------|------|
| Cor. ID/line ID                                                              | 3    | 5    | 11   | 15   | 19   | 38    | 41    | 45    | 52    | 1    |
| Line-1                                                                       | 0.04 | 0.08 | 3.00 | 4.00 | 3.90 | 6.73  | 13.30 | 22.23 | 26.88 | 0.05 |
| Line-2                                                                       | 0.11 | 0.19 | 3.13 | 4.58 | 4.27 | 9.77  | 20.63 | 31.07 | 28.02 | 0.10 |
| Line-3                                                                       | 0.20 | 0.33 | 3.87 | 4.97 | 4.70 | 12.70 | 23.70 | 34.67 | 29.64 | 0.12 |
| Line-4                                                                       | 0.10 | 0.16 | 3.53 | 4.73 | 4.23 | 8.67  | 18.03 | 30.03 | 31.52 | 0.07 |
| Line-5                                                                       | 0.08 | 0.16 | 3.20 | 4.60 | 4.30 | 9.77  | 19.33 | 30.83 | 29.61 | 0.08 |
| Line-6                                                                       | 0.09 | 0.16 | 3.13 | 4.70 | 4.57 | 9.23  | 19.20 | 29.87 | 26.82 | 0.08 |
| Line-7                                                                       | 0.13 | 0.26 | 3.13 | 4.97 | 4.63 | 10.27 | 21.87 | 30.87 | 28.48 | 0.14 |
| Line-8                                                                       | 0.09 | 0.20 | 3.30 | 4.87 | 4.67 | 10.10 | 22.13 | 32.40 | 28.21 | 0.10 |
| Line-9                                                                       | 0.09 | 0.13 | 3.07 | 4.67 | 3.97 | 7.93  | 18.20 | 29.37 | 30.48 | 0.17 |
| Line-10                                                                      | 0.09 | 0.18 | 3.07 | 4.57 | 4.10 | 8.23  | 21.00 | 30.70 | 27.63 | 0.14 |

Table 39: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under low nitrogen conditions. Growth conditions are specified in the experimental procedure section.

TABLE 40

| Additional sorghum accessions, measured parameters under low nitrogen growth conditions |         |       |        |        |         |         |         |       |       |       |       |
|-----------------------------------------------------------------------------------------|---------|-------|--------|--------|---------|---------|---------|-------|-------|-------|-------|
| Corr. ID/<br>line ID                                                                    | 21      | 22    | 23     | 24     | 25      | 26      | 27      | 28    | 49    | 57    | 61    |
| Line-1                                                                                  | 27.528  | 1.875 | 9.647  | 17.881 | 84.528  | 81.573  | 82.585  | 6.892 | 0.002 | 0.003 | 0.005 |
| Line-2                                                                                  | 64.124  | 1.707 | 23.538 | 40.586 | 80.954  | 79.164  | 79.812  | 6.568 | 0.004 | 0.007 | 0.011 |
| Line-3                                                                                  | 115.231 | 1.731 | 43.877 | 71.354 | 117.004 | 104.754 | 109.104 | 6.307 | 0.007 | 0.011 | 0.018 |
| Line- 4                                                                                 | 58.017  | 1.568 | 22.580 | 35.436 | 100.519 | 103.497 | 102.317 | 7.446 | 0.003 | 0.005 | 0.008 |
| Line- 5                                                                                 | 52.219  | 2.096 | 16.886 | 35.333 | 72.538  | 83.707  | 79.737  | 6.886 | 0.003 | 0.005 | 0.008 |
| Line-6                                                                                  | 35.103  | 1.815 | 12.440 | 22.663 | 71.777  | 83.215  | 78.767  | 5.873 | 0.003 | 0.006 | 0.009 |
| Line- 7                                                                                 | 84.575  | 2.062 | 28.194 | 56.381 | 93.472  | 107.689 | 102.492 | 6.146 | 0.005 | 0.009 | 0.014 |
| Line-8                                                                                  | 63.728  | 2.097 | 20.528 | 43.200 | 76.051  | 81.368  | 79.588  | 6.046 | 0.003 | 0.007 | 0.010 |
| Line-9                                                                                  | 47.029  | 1.504 | 18.756 | 28.273 | 86.820  | 70.300  | 76.073  | 7.683 | 0.003 | 0.004 | 0.007 |
| Line-10                                                                                 | 59.998  | 1.999 | 20.086 | 39.912 | 80.511  | 75.859  | 77.355  | 6.740 | 0.003 | 0.007 | 0.010 |

Table 40: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under low nitrogen conditions. Growth conditions are specified in the experimental procedure section.

TABLE 41

| Sorghum accessions, measured parameters under salinity (100 mM NaCl) conditions |       |       |       |       |       |        |
|---------------------------------------------------------------------------------|-------|-------|-------|-------|-------|--------|
| Corr. ID/<br>line ID                                                            | 1     | 6     | 9     | 13    | 17    | 36     |
| Line-1                                                                          | 0.050 | 0.094 | 3.000 | 4.000 | 4.000 | 7.900  |
| Line-2                                                                          | 0.104 | 0.186 | 3.133 | 4.367 | 4.133 | 9.500  |
| Line-3                                                                          | 0.124 | 0.202 | 3.400 | 4.867 | 4.567 | 10.933 |
| Line-4                                                                          | 0.069 | 0.137 | 3.067 | 4.600 | 4.433 | 7.933  |
| Line-5                                                                          | 0.076 | 0.130 | 3.333 | 4.500 | 4.067 | 9.700  |
| Line-6                                                                          | 0.075 | 0.133 | 3.067 | 4.533 | 4.333 | 8.533  |
| Line-7                                                                          | 0.135 | 0.154 | 3.067 | 4.500 | 4.133 | 8.900  |
| Line-8                                                                          | 0.095 | 0.189 | 3.267 | 4.767 | 4.500 | 10.367 |
| Line-9                                                                          | 0.165 | 0.099 | 3.000 | 4.320 | 3.780 | 7.000  |
| Line-10                                                                         | 0.139 | 0.124 | 3.067 | 4.200 | 4.200 | 7.833  |

Table 41: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under 100 mM NaCl growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 42

| Additional Sorghum accessions, measured parameters under salinity (100 mM NaCl) conditions |       |       |       |       |        |        |        |
|--------------------------------------------------------------------------------------------|-------|-------|-------|-------|--------|--------|--------|
| Corr. ID/<br>line ID                                                                       | 29    | 47    | 55    | 59    | 43     | 44     | 54     |
| Line-1                                                                                     | 8.183 | 0.002 | 0.003 | 0.004 | 14.200 | 21.800 | 32.733 |
| Line-2                                                                                     | 8.503 | 0.003 | 0.005 | 0.008 | 16.267 | 23.167 | 35.144 |
| Line-3                                                                                     | 6.124 | 0.004 | 0.007 | 0.012 | 20.367 | 30.367 | 27.967 |
| Line-4                                                                                     | 6.977 | 0.002 | 0.004 | 0.007 | 13.333 | 22.833 | 30.933 |
| Line-5                                                                                     | 8.492 | 0.002 | 0.004 | 0.006 | 15.900 | 23.700 | 34.533 |
| Line-6                                                                                     | 6.921 | 0.003 | 0.004 | 0.007 | 16.533 | 23.300 | 29.989 |
| Line-7                                                                                     | 7.763 | 0.004 | 0.005 | 0.009 | 15.467 | 22.467 | 32.089 |
| Line-8                                                                                     | 7.079 | 0.003 | 0.006 | 0.009 | 18.933 | 26.833 | 31.856 |
| Line-9                                                                                     | 8.601 | 0.005 | 0.003 | 0.008 | 13.680 | 20.280 | 32.513 |
| Line-10                                                                                    | 8.172 | 0.004 | 0.004 | 0.008 | 15.767 | 23.567 | 34.322 |

Table 42: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under 100 mM NaCl growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 43

| Sorghum accessions, measured parameters under cold conditions |       |       |       |       |       |        |        |        |       |       |       |       |
|---------------------------------------------------------------|-------|-------|-------|-------|-------|--------|--------|--------|-------|-------|-------|-------|
| Corr. ID/<br>line ID                                          | 2     | 7     | 10    | 14    | 18    | 37     | 40     | 51     | 30    | 48    | 56    | 60    |
| Line-1                                                        | 0.068 | 0.078 | 3.000 | 3.900 | 4.733 | 6.500  | 11.167 | 28.622 | 6.047 | 0.002 | 0.003 | 0.005 |
| Line-2                                                        | 0.108 | 0.154 | 3.000 | 4.133 | 5.333 | 8.767  | 15.867 | 30.311 | 5.683 | 0.004 | 0.005 | 0.009 |
| Line-3                                                        | 0.163 | 0.189 | 3.500 | 4.633 | 5.433 | 10.400 | 18.433 | 27.044 | 4.978 | 0.006 | 0.007 | 0.013 |
| Line-4                                                        | 0.093 | 0.112 | 3.167 | 4.167 | 5.500 | 6.800  | 12.200 | 32.278 | 5.869 | 0.003 | 0.003 | 0.006 |
| Line-5                                                        | 0.084 | 0.130 | 3.400 | 4.267 | 5.333 | 9.033  | 16.033 | 28.278 | 5.302 | 0.003 | 0.005 | 0.008 |
| Line-6                                                        | 0.114 | 0.165 | 3.200 | 4.233 | 5.067 | 9.000  | 14.633 | 29.889 | 5.899 | 0.004 | 0.006 | 0.009 |
| Line-7                                                        | 0.137 | 0.152 | 3.133 | 4.200 | 4.500 | 7.967  | 14.600 | 32.467 | 7.215 | 0.004 | 0.005 | 0.009 |
| Line-8                                                        | 0.127 | 0.150 | 3.067 | 4.300 | 5.400 | 9.167  | 17.267 | 28.633 | 5.302 | 0.004 | 0.005 | 0.010 |
| Line-9                                                        | 0.108 | 0.112 | 3.067 | 4.167 | 5.367 | 6.500  | 13.433 | 31.711 | 5.909 | 0.003 | 0.004 | 0.007 |
| Line-10                                                       | 0.139 | 0.141 | 3.000 | 4.000 | 5.182 | 7.227  | 13.909 | 29.557 | 5.704 | 0.005 | 0.005 | 0.009 |

Table 43: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under cold growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 44

| Sorghum accessions, measured parameters under regular growth conditions |       |       |       |       |       |        |        |       |        |
|-------------------------------------------------------------------------|-------|-------|-------|-------|-------|--------|--------|-------|--------|
| Corr. ID/line ID                                                        | 4     | 8     | 12    | 16    | 20    | 39     | 42     | 46    | 53     |
| Line-1                                                                  | 0.053 | 0.101 | 3.000 | 4.167 | 5.333 | 7.467  | 14.967 | 0.155 | 26.700 |
| Line-2                                                                  | 0.134 | 0.236 | 3.067 | 4.500 | 5.867 | 9.300  | 18.323 | 0.186 | 29.333 |
| Line-3                                                                  | 0.173 | 0.313 | 3.800 | 4.800 | 6.200 | 12.867 | 22.100 | 0.159 | 29.685 |
| Line-4                                                                  | 0.103 | 0.158 | 3.200 | 4.600 | 5.800 | 8.567  | 17.600 | 0.173 | 29.089 |
| Line-5                                                                  | 0.107 | 0.194 | 3.233 | 4.533 | 5.800 | 8.933  | 18.067 | 0.171 | 24.978 |
| Line-6                                                                  | 0.120 | 0.188 | 3.233 | 4.967 | 5.733 | 8.533  | 18.353 | 0.168 | 24.622 |
| Line-7                                                                  | 0.139 | 0.241 | 3.133 | 4.600 | 5.733 | 10.667 | 22.833 | 0.174 | 30.789 |
| Line-8                                                                  | 0.124 | 0.244 | 3.433 | 4.933 | 6.000 | 10.267 | 22.303 | 0.171 | 25.500 |
| Line-9                                                                  | 0.099 | 0.185 | 3.000 | 4.500 | 5.600 | 7.867  | 20.033 | 0.174 | 32.889 |
| Line-10                                                                 | 0.115 | 0.242 | 3.000 | 4.567 | 6.067 | 8.767  | 21.800 | 0.204 | 33.544 |

Table 44: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under cold growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 45

| Additional Sorghum accessions, measured parameters under regular growth conditions |       |       |       |       |       |       |       |       |
|------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Corr. ID/<br>line ID                                                               | 31    | 32    | 33    | 34    | 35    | 50    | 58    | 62    |
| Line-1                                                                             | 5.006 | 1.984 | 0.861 | 1.653 | 2.514 | 0.002 | 0.004 | 0.006 |
| Line-2                                                                             | 5.000 | 1.936 | 2.193 | 3.866 | 6.059 | 0.005 | 0.008 | 0.013 |
| Line-3                                                                             | 4.815 | 1.897 | 2.828 | 5.137 | 7.964 | 0.006 | 0.010 | 0.016 |
| Line-4                                                                             | 5.015 | 1.586 | 1.694 | 2.582 | 4.276 | 0.004 | 0.005 | 0.009 |
| Line-5                                                                             | 4.307 | 1.813 | 1.755 | 3.183 | 4.939 | 0.004 | 0.008 | 0.012 |
| Line-6                                                                             | 4.295 | 1.579 | 1.960 | 3.081 | 5.041 | 0.005 | 0.008 | 0.012 |
| Line-7                                                                             | 5.370 | 1.759 | 2.275 | 3.948 | 6.223 | 0.005 | 0.008 | 0.012 |

TABLE 45-continued

| Additional Sorghum accessions, measured parameters under regular growth conditions |       |       |       |       |       |       |       |       |
|------------------------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Corr. ID/<br>line ID                                                               | 31    | 32    | 33    | 34    | 35    | 50    | 58    | 62    |
| Line-8                                                                             | 4.250 | 1.988 | 2.036 | 4.003 | 6.038 | 0.005 | 0.010 | 0.014 |
| Line-9                                                                             | 5.873 | 1.895 | 1.086 | 2.022 | 3.108 | 0.003 | 0.006 | 0.009 |
| Line-10                                                                            | 5.529 | 2.198 | 1.881 | 3.968 | 5.849 | 0.003 | 0.007 | 0.011 |

Table 45: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under regular growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 46

| Correlation between the expression level of selected genes of some embodiments of the invention in roots and the phenotypic performance under normal or abiotic stress conditions across Sorghum accessions |       |          |          |             |           |       |          |          |              |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|--------------|--|
| Gene Name                                                                                                                                                                                                   | R     | P value  | Exp. set | Corr Set ID | Gene Name | R     | P value  | Exp. set | Corr. Set ID |  |
| LNU856                                                                                                                                                                                                      | 0.862 | 1.26E-02 | 3        | 49          | LNU856    | 0.860 | 1.31E-02 | 3        | 3            |  |
| LNU856                                                                                                                                                                                                      | 0.933 | 2.14E-03 | 3        | 5           | LNU856    | 0.812 | 2.67E-02 | 3        | 45           |  |
| LNU856                                                                                                                                                                                                      | 0.851 | 1.52E-02 | 3        | 23          | LNU856    | 0.896 | 6.34E-03 | 3        | 61           |  |
| LNU856                                                                                                                                                                                                      | 0.928 | 2.59E-03 | 3        | 24          | LNU856    | 0.921 | 3.24E-03 | 3        | 21           |  |
| LNU856                                                                                                                                                                                                      | 0.877 | 9.56E-03 | 3        | 57          | LNU856    | 0.855 | 1.42E-02 | 3        | 41           |  |
| LNU856                                                                                                                                                                                                      | 0.801 | 9.50E-03 | 2        | 20          | LNU856    | 0.840 | 2.37E-03 | 1        | 18           |  |
| LNU857                                                                                                                                                                                                      | 0.716 | 7.05E-02 | 3        | 22          | LNU857    | 0.812 | 7.87E-03 | 6        | 49           |  |
| LNU857                                                                                                                                                                                                      | 0.777 | 1.37E-02 | 6        | 3           | LNU857    | 0.778 | 1.36E-02 | 6        | 5            |  |
| LNU857                                                                                                                                                                                                      | 0.777 | 1.37E-02 | 6        | 23          | LNU857    | 0.811 | 7.92E-03 | 6        | 61           |  |
| LNU857                                                                                                                                                                                                      | 0.778 | 1.36E-02 | 6        | 24          | LNU857    | 0.787 | 1.19E-02 | 6        | 21           |  |

TABLE 46-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in roots and the phenotypic performance under normal or abiotic stress conditions across Sorghum accessions |       |          |          |             |           |       |          |          |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                                   | R     | P value  | Exp. set | Corr Set ID | Gene Name | R     | P value  | Exp. set | Corr Set ID |
| LNU857                                                                                                                                                                                                      | 0.727 | 2.65E-02 | 6        | 38          | LNU857    | 0.795 | 1.04E-02 | 6        | 57          |
| LNU857                                                                                                                                                                                                      | 0.703 | 3.47E-02 | 2        | 34          | LNU857    | 0.757 | 1.82E-02 | 5        | 7           |
| LNU857                                                                                                                                                                                                      | 0.744 | 2.15E-02 | 5        | 48          | LNU857    | 0.701 | 3.52E-02 | 5        | 10          |
| LNU857                                                                                                                                                                                                      | 0.858 | 3.08E-03 | 5        | 56          | LNU857    | 0.827 | 5.94E-03 | 5        | 60          |
| LNU857                                                                                                                                                                                                      | 0.847 | 3.99E-03 | 5        | 37          | LNU857    | 0.871 | 2.26E-03 | 5        | 40          |
| LNU857                                                                                                                                                                                                      | 0.854 | 3.42E-03 | 5        | 14          | LNU859    | 0.899 | 3.96E-04 | 1        | 48          |
| LNU859                                                                                                                                                                                                      | 0.850 | 1.84E-03 | 1        | 2           | LNU859    | 0.712 | 2.10E-02 | 1        | 56          |
| LNU859                                                                                                                                                                                                      | 0.829 | 3.04E-03 | 1        | 60          | LNU860    | 0.848 | 1.59E-02 | 3        | 28          |
| LNU860                                                                                                                                                                                                      | 0.721 | 2.82E-02 | 6        | 45          | LNU861    | 0.756 | 1.85E-02 | 6        | 45          |
| LNU861                                                                                                                                                                                                      | 0.768 | 1.57E-02 | 6        | 41          | LNU861    | 0.700 | 3.57E-02 | 8        | 4           |
| LNU861                                                                                                                                                                                                      | 0.776 | 1.40E-02 | 8        | 42          | LNU862    | 0.705 | 7.70E-02 | 3        | 26          |
| LNU862                                                                                                                                                                                                      | 0.804 | 8.99E-03 | 5        | 30          | LNU863    | 0.792 | 1.09E-02 | 6        | 49          |
| LNU863                                                                                                                                                                                                      | 0.790 | 1.13E-02 | 6        | 3           | LNU863    | 0.734 | 2.43E-02 | 6        | 5           |
| LNU863                                                                                                                                                                                                      | 0.790 | 1.13E-02 | 6        | 23          | LNU863    | 0.756 | 1.84E-02 | 6        | 61          |
| LNU863                                                                                                                                                                                                      | 0.734 | 2.43E-02 | 6        | 24          | LNU863    | 0.764 | 1.65E-02 | 6        | 21          |
| LNU863                                                                                                                                                                                                      | 0.720 | 2.88E-02 | 6        | 57          | LNU863    | 0.738 | 2.32E-02 | 7        | 1           |
| LNU863                                                                                                                                                                                                      | 0.818 | 7.05E-03 | 7        | 59          | LNU863    | 0.838 | 4.83E-03 | 7        | 47          |
| LNU863                                                                                                                                                                                                      | 0.766 | 1.60E-02 | 2        | 8           | LNU863    | 0.781 | 1.29E-02 | 2        | 42          |
| LNU863                                                                                                                                                                                                      | 0.709 | 3.26E-02 | 8        | 20          | LNU863    | 0.838 | 4.76E-03 | 8        | 42          |
| LNU864                                                                                                                                                                                                      | 0.801 | 3.04E-02 | 3        | 28          | LNU864    | 0.897 | 1.05E-03 | 5        | 30          |
| LNU866                                                                                                                                                                                                      | 0.719 | 6.86E-02 | 3        | 5           | LNU866    | 0.720 | 6.82E-02 | 3        | 45          |
| LNU866                                                                                                                                                                                                      | 0.721 | 6.77E-02 | 3        | 24          | LNU866    | 0.705 | 7.71E-02 | 3        | 57          |
| LNU866                                                                                                                                                                                                      | 0.817 | 2.48E-02 | 3        | 41          | LNU870    | 0.840 | 1.80E-02 | 3        | 5           |
| LNU870                                                                                                                                                                                                      | 0.861 | 1.28E-02 | 3        | 45          | LNU870    | 0.766 | 4.45E-02 | 3        | 61          |
| LNU870                                                                                                                                                                                                      | 0.790 | 3.46E-02 | 3        | 38          | LNU870    | 0.829 | 2.11E-02 | 3        | 57          |
| LNU870                                                                                                                                                                                                      | 0.879 | 9.10E-03 | 3        | 41          | LNU870    | 0.705 | 3.39E-02 | 6        | 52          |
| LNU871                                                                                                                                                                                                      | 0.701 | 3.55E-02 | 5        | 10          | LNU872    | 0.739 | 5.75E-02 | 3        | 52          |
| LNU872                                                                                                                                                                                                      | 0.793 | 1.09E-02 | 6        | 49          | LNU872    | 0.780 | 1.32E-02 | 6        | 3           |
| LNU872                                                                                                                                                                                                      | 0.800 | 9.62E-03 | 6        | 5           | LNU872    | 0.739 | 2.29E-02 | 6        | 11          |
| LNU872                                                                                                                                                                                                      | 0.780 | 1.32E-02 | 6        | 23          | LNU872    | 0.802 | 9.38E-03 | 6        | 61          |
| LNU872                                                                                                                                                                                                      | 0.800 | 9.62E-03 | 6        | 24          | LNU872    | 0.802 | 9.33E-03 | 6        | 21          |
| LNU872                                                                                                                                                                                                      | 0.841 | 4.52E-03 | 6        | 38          | LNU872    | 0.791 | 1.11E-02 | 6        | 57          |
| LNU876                                                                                                                                                                                                      | 0.809 | 2.75E-02 | 3        | 5           | LNU876    | 0.792 | 3.39E-02 | 3        | 45          |
| LNU876                                                                                                                                                                                                      | 0.703 | 7.82E-02 | 3        | 61          | LNU876    | 0.705 | 7.70E-02 | 3        | 22          |
| LNU876                                                                                                                                                                                                      | 0.877 | 9.56E-03 | 3        | 38          | LNU876    | 0.713 | 7.21E-02 | 3        | 19          |
| LNU876                                                                                                                                                                                                      | 0.723 | 6.66E-02 | 3        | 57          | LNU876    | 0.801 | 9.52E-03 | 6        | 49          |
| LNU876                                                                                                                                                                                                      | 0.830 | 5.65E-03 | 6        | 3           | LNU876    | 0.790 | 1.12E-02 | 6        | 5           |
| LNU876                                                                                                                                                                                                      | 0.782 | 1.28E-02 | 6        | 45          | LNU876    | 0.798 | 9.87E-03 | 6        | 11          |
| LNU876                                                                                                                                                                                                      | 0.830 | 5.65E-03 | 6        | 23          | LNU876    | 0.774 | 1.43E-02 | 6        | 61          |
| LNU876                                                                                                                                                                                                      | 0.790 | 1.12E-02 | 6        | 24          | LNU876    | 0.797 | 1.01E-02 | 6        | 21          |
| LNU876                                                                                                                                                                                                      | 0.773 | 1.45E-02 | 6        | 38          | LNU876    | 0.760 | 1.74E-02 | 6        | 57          |
| LNU876                                                                                                                                                                                                      | 0.754 | 1.90E-02 | 6        | 41          | LNU876    | 0.740 | 2.25E-02 | 2        | 46          |
| LNU876                                                                                                                                                                                                      | 0.713 | 3.12E-02 | 2        | 12          | LNU876    | 0.827 | 5.95E-03 | 2        | 20          |
| LNU876                                                                                                                                                                                                      | 0.807 | 8.53E-03 | 5        | 14          | LNU876    | 0.720 | 1.89E-02 | 1        | 14          |
| LNU878                                                                                                                                                                                                      | 0.901 | 5.64E-03 | 3        | 27          | LNU878    | 0.825 | 2.22E-02 | 3        | 25          |
| LNU878                                                                                                                                                                                                      | 0.779 | 3.88E-02 | 3        | 11          | LNU878    | 0.793 | 3.33E-02 | 3        | 26          |
| LNU878                                                                                                                                                                                                      | 0.755 | 1.16E-02 | 1        | 30          | LNU879    | 0.877 | 9.44E-03 | 3        | 27          |
| LNU879                                                                                                                                                                                                      | 0.724 | 6.60E-02 | 3        | 25          | LNU879    | 0.904 | 5.24E-03 | 3        | 11          |
| LNU879                                                                                                                                                                                                      | 0.749 | 5.28E-02 | 3        | 28          | LNU879    | 0.897 | 6.12E-03 | 3        | 26          |
| LNU879                                                                                                                                                                                                      | 0.724 | 2.73E-02 | 7        | 54          | LNU879    | 0.811 | 7.99E-03 | 2        | 46          |
| LNU879                                                                                                                                                                                                      | 0.888 | 1.37E-03 | 2        | 32          | LNU879    | 0.711 | 3.17E-02 | 5        | 7           |
| LNU879                                                                                                                                                                                                      | 0.821 | 6.73E-03 | 5        | 56          | LNU879    | 0.761 | 1.71E-02 | 5        | 60          |
| LNU879                                                                                                                                                                                                      | 0.832 | 5.38E-03 | 5        | 37          | LNU879    | 0.785 | 1.23E-02 | 5        | 40          |
| LNU879                                                                                                                                                                                                      | 0.820 | 6.79E-03 | 5        | 14          | LNU879    | 0.741 | 1.43E-02 | 1        | 30          |
| LNU881                                                                                                                                                                                                      | 0.731 | 6.19E-02 | 3        | 38          | LNU883    | 0.744 | 5.51E-02 | 3        | 49          |
| LNU883                                                                                                                                                                                                      | 0.750 | 5.21E-02 | 3        | 3           | LNU883    | 0.901 | 5.61E-03 | 3        | 5           |
| LNU883                                                                                                                                                                                                      | 0.794 | 3.30E-02 | 3        | 45          | LNU883    | 0.708 | 7.50E-02 | 3        | 11          |
| LNU883                                                                                                                                                                                                      | 0.828 | 2.14E-02 | 3        | 61          | LNU883    | 0.781 | 3.82E-02 | 3        | 24          |
| LNU883                                                                                                                                                                                                      | 0.747 | 5.34E-02 | 3        | 21          | LNU883    | 0.701 | 7.93E-02 | 3        | 38          |
| LNU883                                                                                                                                                                                                      | 0.753 | 5.08E-02 | 3        | 19          | LNU883    | 0.839 | 1.83E-02 | 3        | 57          |
| LNU883                                                                                                                                                                                                      | 0.768 | 4.35E-02 | 3        | 41          | LNU883    | 0.700 | 3.57E-02 | 5        | 30          |
| LNU884                                                                                                                                                                                                      | 0.745 | 5.48E-02 | 3        | 23          | LNU884    | 0.725 | 6.54E-02 | 3        | 24          |
| LNU884                                                                                                                                                                                                      | 0.750 | 5.23E-02 | 3        | 21          | LNU884    | 0.704 | 7.77E-02 | 3        | 41          |
| LNU884                                                                                                                                                                                                      | 0.714 | 3.09E-02 | 8        | 50          | LNU884    | 0.713 | 3.12E-02 | 8        | 12          |
| LNU884                                                                                                                                                                                                      | 0.729 | 1.67E-02 | 1        | 7           | LNU884    | 0.748 | 1.28E-02 | 1        | 56          |
| LNU884                                                                                                                                                                                                      | 0.787 | 6.95E-03 | 1        | 37          | LNU885    | 0.851 | 1.51E-02 | 3        | 52          |
| LNU885                                                                                                                                                                                                      | 0.709 | 7.44E-02 | 3        | 28          | LNU885    | 0.736 | 2.37E-02 | 2        | 39          |
| LNU885                                                                                                                                                                                                      | 0.821 | 6.72E-03 | 5        | 18          | LNU888    | 0.835 | 1.93E-02 | 3        | 27          |
| LNU888                                                                                                                                                                                                      | 0.844 | 1.70E-02 | 3        | 25          | LNU888    | 0.762 | 4.66E-02 | 3        | 11          |
| LNU889                                                                                                                                                                                                      | 0.794 | 1.06E-02 | 5        | 10          | LNU889    | 0.740 | 2.27E-02 | 5        | 56          |
| LNU889                                                                                                                                                                                                      | 0.710 | 3.22E-02 | 5        | 60          | LNU889    | 0.713 | 3.11E-02 | 5        | 37          |
| LNU889                                                                                                                                                                                                      | 0.847 | 3.95E-03 | 5        | 14          | LNU892    | 0.799 | 3.12E-02 | 3        | 3           |
| LNU892                                                                                                                                                                                                      | 0.796 | 3.23E-02 | 3        | 11          | LNU895    | 0.803 | 2.96E-02 | 3        | 49          |

TABLE 46-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in roots and the phenotypic performance under normal or abiotic stress conditions across Sorghum accessions |       |          |          |             |           |       |          |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|--------------|
| Gene Name                                                                                                                                                                                                   | R     | P value  | Exp. set | Corr Set ID | Gene Name | R     | P value  | Exp. set | Corr. Set ID |
| LNU895                                                                                                                                                                                                      | 0.857 | 1.37E-02 | 3        | 3           | LNU895    | 0.845 | 1.66E-02 | 3        | 15           |
| LNU895                                                                                                                                                                                                      | 0.718 | 6.92E-02 | 3        | 5           | LNU895    | 0.868 | 1.14E-02 | 3        | 45           |
| LNU895                                                                                                                                                                                                      | 0.877 | 9.60E-03 | 3        | 23          | LNU895    | 0.700 | 7.99E-02 | 3        | 61           |
| LNU895                                                                                                                                                                                                      | 0.765 | 4.53E-02 | 3        | 24          | LNU895    | 0.826 | 2.22E-02 | 3        | 21           |
| LNU895                                                                                                                                                                                                      | 0.717 | 6.97E-02 | 3        | 38          | LNU895    | 0.779 | 3.91E-02 | 3        | 41           |
| LNU895                                                                                                                                                                                                      | 0.723 | 2.77E-02 | 6        | 45          | LNU895    | 0.707 | 3.31E-02 | 6        | 52           |
| LNU895                                                                                                                                                                                                      | 0.710 | 3.21E-02 | 2        | 53          | LNU895    | 0.825 | 6.24E-03 | 8        | 31           |
| LNU895                                                                                                                                                                                                      | 0.787 | 1.18E-02 | 8        | 53          | LNU895    | 0.765 | 9.90E-03 | 1        | 18           |
| LNU896                                                                                                                                                                                                      | 0.773 | 4.15E-02 | 3        | 27          | LNU896    | 0.806 | 2.87E-02 | 3        | 25           |
| LNU896                                                                                                                                                                                                      | 0.703 | 2.33E-02 | 1        | 30          | LNU897    | 0.715 | 3.05E-02 | 7        | 1            |
| LNU897                                                                                                                                                                                                      | 0.710 | 3.21E-02 | 8        | 46          | LNU897    | 0.751 | 1.97E-02 | 8        | 53           |
| LNU898                                                                                                                                                                                                      | 0.717 | 7.00E-02 | 3        | 45          | LNU898    | 0.918 | 3.53E-03 | 3        | 38           |
| LNU898                                                                                                                                                                                                      | 0.705 | 3.41E-02 | 6        | 38          | LNU898    | 0.771 | 9.01E-03 | 1        | 7            |
| LNU898                                                                                                                                                                                                      | 0.779 | 7.96E-03 | 1        | 56          | LNU898    | 0.723 | 1.82E-02 | 1        | 60           |
| LNU898                                                                                                                                                                                                      | 0.834 | 2.68E-03 | 1        | 37          | LNU898    | 0.825 | 3.31E-03 | 1        | 40           |
| LNU901                                                                                                                                                                                                      | 0.808 | 8.46E-03 | 8        | 50          | LNU901    | 0.726 | 2.68E-02 | 8        | 35           |
| LNU901                                                                                                                                                                                                      | 0.831 | 5.48E-03 | 8        | 39          | LNU901    | 0.786 | 1.20E-02 | 8        | 4            |
| LNU901                                                                                                                                                                                                      | 0.735 | 2.42E-02 | 8        | 62          | LNU901    | 0.796 | 1.03E-02 | 8        | 33           |
| LNU902                                                                                                                                                                                                      | 0.761 | 1.73E-02 | 6        | 5           | LNU902    | 0.738 | 2.33E-02 | 6        | 61           |
| LNU902                                                                                                                                                                                                      | 0.761 | 1.73E-02 | 6        | 24          | LNU902    | 0.738 | 2.32E-02 | 6        | 21           |
| LNU902                                                                                                                                                                                                      | 0.753 | 1.91E-02 | 6        | 57          | LNU902    | 0.714 | 3.06E-02 | 6        | 41           |
| LNU902                                                                                                                                                                                                      | 0.887 | 1.44E-03 | 7        | 1           | LNU902    | 0.923 | 3.91E-04 | 7        | 47           |
| LNU902                                                                                                                                                                                                      | 0.767 | 1.59E-02 | 5        | 18          | LNU903    | 0.701 | 7.93E-02 | 3        | 28           |
| LNU903                                                                                                                                                                                                      | 0.768 | 1.57E-02 | 6        | 52          | LNU903    | 0.863 | 1.29E-03 | 1        | 18           |
| LNU904                                                                                                                                                                                                      | 0.777 | 3.97E-02 | 3        | 22          | LNU904    | 0.716 | 3.01E-02 | 7        | 43           |
| LNU905                                                                                                                                                                                                      | 0.807 | 2.82E-02 | 3        | 22          | LNU905    | 0.708 | 3.27E-02 | 2        | 32           |
| LNU906                                                                                                                                                                                                      | 0.767 | 4.41E-02 | 3        | 49          | LNU906    | 0.729 | 6.29E-02 | 3        | 5            |
| LNU906                                                                                                                                                                                                      | 0.810 | 2.73E-02 | 3        | 45          | LNU906    | 0.777 | 3.97E-02 | 3        | 61           |
| LNU906                                                                                                                                                                                                      | 0.778 | 3.95E-02 | 3        | 38          | LNU906    | 0.750 | 5.22E-02 | 3        | 57           |
| LNU906                                                                                                                                                                                                      | 0.816 | 2.53E-02 | 3        | 41          | LNU907    | 0.758 | 1.79E-02 | 8        | 20           |
| LNU910                                                                                                                                                                                                      | 0.825 | 6.17E-03 | 6        | 49          | LNU910    | 0.846 | 4.09E-03 | 6        | 3            |
| LNU910                                                                                                                                                                                                      | 0.828 | 5.87E-03 | 6        | 25          | LNU910    | 0.725 | 2.71E-02 | 6        | 5            |
| LNU910                                                                                                                                                                                                      | 0.846 | 4.09E-03 | 6        | 23          | LNU910    | 0.745 | 2.12E-02 | 6        | 61           |
| LNU910                                                                                                                                                                                                      | 0.725 | 2.71E-02 | 6        | 24          | LNU910    | 0.780 | 1.32E-02 | 6        | 21           |
| LNU911                                                                                                                                                                                                      | 0.880 | 8.99E-03 | 3        | 27          | LNU911    | 0.745 | 5.47E-02 | 3        | 11           |
| LNU911                                                                                                                                                                                                      | 0.849 | 1.56E-02 | 3        | 26          |           |       |          |          |              |
| LNU913                                                                                                                                                                                                      | 0.720 | 2.88E-02 | 7        | 55          | LNU913    | 0.762 | 1.71E-02 | 7        | 43           |
| LNU913                                                                                                                                                                                                      | 0.709 | 3.25E-02 | 5        | 51          | LNU914    | 0.778 | 3.95E-02 | 3        | 5            |
| LNU914                                                                                                                                                                                                      | 0.709 | 7.45E-02 | 3        | 45          | LNU914    | 0.807 | 2.83E-02 | 3        | 61           |
| LNU914                                                                                                                                                                                                      | 0.794 | 3.30E-02 | 3        | 19          | LNU914    | 0.840 | 1.81E-02 | 3        | 57           |
| LNU914                                                                                                                                                                                                      | 0.774 | 4.12E-02 | 3        | 41          | LNU914    | 0.787 | 1.19E-02 | 6        | 45           |
| LNU914                                                                                                                                                                                                      | 0.808 | 8.36E-03 | 6        | 52          | LNU914    | 0.726 | 2.67E-02 | 6        | 41           |
| LNU915                                                                                                                                                                                                      | 0.841 | 1.77E-02 | 3        | 49          | LNU915    | 0.887 | 7.78E-03 | 3        | 3            |
| LNU915                                                                                                                                                                                                      | 0.837 | 1.87E-02 | 3        | 15          | LNU915    | 0.710 | 7.36E-02 | 3        | 45           |
| LNU915                                                                                                                                                                                                      | 0.702 | 7.90E-02 | 3        | 61          | LNU915    | 0.701 | 3.53E-02 | 5        | 48           |
| LNU915                                                                                                                                                                                                      | 0.759 | 1.76E-02 | 5        | 2           | LNU917    | 0.840 | 4.56E-03 | 2        | 46           |
| LNU917                                                                                                                                                                                                      | 0.737 | 2.36E-02 | 2        | 32          | LNU917    | 0.888 | 1.38E-03 | 8        | 32           |
| LNU918                                                                                                                                                                                                      | 0.824 | 2.27E-02 | 3        | 25          | LNU918    | 0.859 | 3.03E-03 | 2        | 46           |
| LNU918                                                                                                                                                                                                      | 0.714 | 3.06E-02 | 2        | 53          | LNU918    | 0.748 | 2.04E-02 | 8        | 32           |
| LNU919                                                                                                                                                                                                      | 0.907 | 4.82E-03 | 3        | 25          | LNU920    | 0.743 | 2.18E-02 | 5        | 51           |
| LNU922                                                                                                                                                                                                      | 0.717 | 2.98E-02 | 6        | 22          | LNU922    | 0.803 | 5.12E-03 | 1        | 48           |
| LNU922                                                                                                                                                                                                      | 0.749 | 1.26E-02 | 1        | 2           | LNU922    | 0.769 | 9.35E-03 | 1        | 60           |
| LNU924                                                                                                                                                                                                      | 0.759 | 1.78E-02 | 8        | 16          | LNU926    | 0.705 | 7.68E-02 | 3        | 49           |
| LNU926                                                                                                                                                                                                      | 0.713 | 3.12E-02 | 7        | 1           | LNU926    | 0.792 | 1.10E-02 | 7        | 59           |
| LNU926                                                                                                                                                                                                      | 0.726 | 2.67E-02 | 7        | 47          | LNU926    | 0.802 | 9.37E-03 | 5        | 18           |
| LNU929                                                                                                                                                                                                      | 0.811 | 2.68E-02 | 3        | 23          | LNU929    | 0.726 | 6.46E-02 | 3        | 24           |
| LNU929                                                                                                                                                                                                      | 0.773 | 4.16E-02 | 3        | 21          | LNU929    | 0.834 | 5.24E-03 | 2        | 46           |
| LNU930                                                                                                                                                                                                      | 0.734 | 6.01E-02 | 3        | 52          | LNU930    | 0.757 | 4.87E-02 | 3        | 22           |
| LNU931                                                                                                                                                                                                      | 0.729 | 2.59E-02 | 2        | 50          | LNU931    | 0.769 | 1.54E-02 | 2        | 12           |
| LNU931                                                                                                                                                                                                      | 0.759 | 1.77E-02 | 2        | 58          | LNU931    | 0.759 | 1.78E-02 | 2        | 62           |
| LNU932                                                                                                                                                                                                      | 0.749 | 2.01E-02 | 6        | 22          | LNU933    | 0.881 | 8.82E-03 | 3        | 49           |
| LNU933                                                                                                                                                                                                      | 0.887 | 7.74E-03 | 3        | 3           | LNU933    | 0.742 | 5.60E-02 | 3        | 15           |
| LNU933                                                                                                                                                                                                      | 0.803 | 2.97E-02 | 3        | 23          | LNU933    | 0.713 | 7.22E-02 | 3        | 61           |
| LNU933                                                                                                                                                                                                      | 0.798 | 9.90E-03 | 8        | 12          | LNU933    | 0.713 | 3.12E-02 | 8        | 58           |
| LNU934                                                                                                                                                                                                      | 0.817 | 2.48E-02 | 3        | 27          | LNU934    | 0.818 | 2.45E-02 | 3        | 25           |
| LNU934                                                                                                                                                                                                      | 0.803 | 2.98E-02 | 3        | 11          | LNU934    | 0.703 | 7.80E-02 | 3        | 52           |

TABLE 46-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in roots and the phenotypic performance under normal or abiotic stress conditions across Sorghum accessions |       |          |          |             |           |       |          |          |             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                                   | R     | P value  | Exp. set | Corr Set ID | Gene Name | R     | P value  | Exp. set | Corr Set ID |
| LNU934                                                                                                                                                                                                      | 0.861 | 2.90E-03 | 5        | 51          | LNU934    | 0.771 | 1.50E-02 | 5        | 30          |
| LNU935                                                                                                                                                                                                      | 0.736 | 2.38E-02 | 6        | 41          | LNU935    | 0.700 | 3.57E-02 | 8        | 8           |
| LNU935                                                                                                                                                                                                      | 0.758 | 1.78E-02 | 8        | 39          | LNU935    | 0.746 | 2.10E-02 | 8        | 4           |
| LNU935                                                                                                                                                                                                      | 0.856 | 3.25E-03 | 8        | 42          | LNU940    | 0.851 | 1.51E-02 | 3        | 11          |
| LNU940                                                                                                                                                                                                      | 0.904 | 5.20E-03 | 3        | 52          | LNU941    | 0.785 | 3.66E-02 | 3        | 25          |
| LNU942                                                                                                                                                                                                      | 0.916 | 3.72E-03 | 3        | 49          | LNU942    | 0.915 | 3.90E-03 | 3        | 3           |
| LNU942                                                                                                                                                                                                      | 0.786 | 3.61E-02 | 3        | 23          | LNU942    | 0.759 | 4.80E-02 | 3        | 61          |
| LNU942                                                                                                                                                                                                      | 0.784 | 1.25E-02 | 7        | 44          | LNU942    | 0.764 | 1.66E-02 | 7        | 55          |
| LNU942                                                                                                                                                                                                      | 0.871 | 2.24E-03 | 7        | 9           | LNU942    | 0.793 | 1.08E-02 | 7        | 13          |
| LNU942                                                                                                                                                                                                      | 0.792 | 1.09E-02 | 7        | 36          | LNU942    | 0.744 | 2.15E-02 | 7        | 59          |
| LNU942                                                                                                                                                                                                      | 0.811 | 8.01E-03 | 7        | 43          | LNU942    | 0.767 | 1.59E-02 | 7        | 6           |
| LNU942                                                                                                                                                                                                      | 0.744 | 2.16E-02 | 8        | 4           | LNU943    | 0.713 | 3.11E-02 | 6        | 49          |
| LNU943                                                                                                                                                                                                      | 0.750 | 1.99E-02 | 6        | 3           | LNU943    | 0.790 | 1.12E-02 | 6        | 25          |
| LNU943                                                                                                                                                                                                      | 0.750 | 1.99E-02 | 6        | 23          | LNU944    | 0.715 | 7.09E-02 | 3        | 49          |
| LNU944                                                                                                                                                                                                      | 0.739 | 5.78E-02 | 3        | 3           | LNU944    | 0.928 | 2.57E-03 | 3        | 15          |
| LNU944                                                                                                                                                                                                      | 0.807 | 2.81E-02 | 3        | 45          | LNU944    | 0.735 | 6.01E-02 | 3        | 41          |
| LNU944                                                                                                                                                                                                      | 0.710 | 3.21E-02 | 7        | 6           | LNU944    | 0.826 | 6.07E-03 | 2        | 12          |
| LNU944                                                                                                                                                                                                      | 0.721 | 2.83E-02 | 2        | 35          | LNU944    | 0.715 | 3.05E-02 | 2        | 34          |
| LNU944                                                                                                                                                                                                      | 0.742 | 2.21E-02 | 2        | 8           | LNU944    | 0.714 | 3.07E-02 | 2        | 20          |
| LNU944                                                                                                                                                                                                      | 0.826 | 6.06E-03 | 2        | 39          | LNU944    | 0.748 | 2.04E-02 | 2        | 4           |
| LNU944                                                                                                                                                                                                      | 0.739 | 2.30E-02 | 2        | 58          | LNU944    | 0.734 | 2.44E-02 | 2        | 62          |
| LNU944                                                                                                                                                                                                      | 0.711 | 3.17E-02 | 2        | 33          | LNU945    | 0.830 | 2.08E-02 | 3        | 22          |
| LNU945                                                                                                                                                                                                      | 0.746 | 2.10E-02 | 6        | 22          | LNU952    | 0.789 | 1.15E-02 | 7        | 29          |
| LNU952                                                                                                                                                                                                      | 0.814 | 7.65E-03 | 7        | 54          | LNU952    | 0.708 | 3.28E-02 | 8        | 32          |
| LNU953                                                                                                                                                                                                      | 0.805 | 2.91E-02 | 3        | 27          | LNU953    | 0.776 | 4.04E-02 | 3        | 11          |
| LNU953                                                                                                                                                                                                      | 0.906 | 4.97E-03 | 3        | 26          | LNU953    | 0.729 | 2.58E-02 | 2        | 35          |
| LNU953                                                                                                                                                                                                      | 0.734 | 2.43E-02 | 2        | 39          | LNU953    | 0.701 | 3.53E-02 | 2        | 4           |
| LNU953                                                                                                                                                                                                      | 0.769 | 1.55E-02 | 2        | 33          | LNU953    | 0.741 | 1.43E-02 | 1        | 37          |
| LNU954                                                                                                                                                                                                      | 0.707 | 3.31E-02 | 5        | 10          | LNU955    | 0.718 | 2.95E-02 | 7        | 44          |
| LNU955                                                                                                                                                                                                      | 0.725 | 2.70E-02 | 8        | 33          | LNU956    | 0.720 | 6.80E-02 | 3        | 22          |
| LNU956                                                                                                                                                                                                      | 0.713 | 3.11E-02 | 6        | 22          | LNU958    | 0.797 | 3.17E-02 | 3        | 22          |
| LNU958                                                                                                                                                                                                      | 0.826 | 6.10E-03 | 6        | 15          | LNU958    | 0.724 | 2.75E-02 | 6        | 5           |
| LNU958                                                                                                                                                                                                      | 0.798 | 9.93E-03 | 6        | 45          | LNU958    | 0.704 | 3.43E-02 | 6        | 52          |
| LNU958                                                                                                                                                                                                      | 0.724 | 2.75E-02 | 6        | 24          | LNU958    | 0.711 | 3.18E-02 | 6        | 57          |
| LNU958                                                                                                                                                                                                      | 0.809 | 8.24E-03 | 6        | 41          | LNU958    | 0.846 | 4.08E-03 | 2        | 32          |
| LNU958                                                                                                                                                                                                      | 0.766 | 1.61E-02 | 5        | 37          | LNU958    | 0.789 | 1.14E-02 | 8        | 16          |
| LNU958                                                                                                                                                                                                      | 0.792 | 1.09E-02 | 8        | 42          | LNU959    | 0.799 | 3.12E-02 | 3        | 19          |
| LNU959                                                                                                                                                                                                      | 0.723 | 2.78E-02 | 8        | 50          | LNU959    | 0.749 | 2.03E-02 | 8        | 33          |
| LNU960                                                                                                                                                                                                      | 0.742 | 5.60E-02 | 3        | 11          | LNU962    | 0.739 | 5.80E-02 | 3        | 25          |
| LNU964                                                                                                                                                                                                      | 0.837 | 1.88E-02 | 3        | 49          | LNU964    | 0.852 | 1.49E-02 | 3        | 3           |
| LNU964                                                                                                                                                                                                      | 0.727 | 6.44E-02 | 3        | 15          | LNU964    | 0.884 | 8.34E-03 | 3        | 5           |
| LNU964                                                                                                                                                                                                      | 0.760 | 4.75E-02 | 3        | 45          | LNU964    | 0.834 | 1.97E-02 | 3        | 11          |
| LNU964                                                                                                                                                                                                      | 0.778 | 3.93E-02 | 3        | 23          | LNU964    | 0.756 | 4.91E-02 | 3        | 52          |
| LNU964                                                                                                                                                                                                      | 0.841 | 1.76E-02 | 3        | 61          | LNU964    | 0.813 | 2.63E-02 | 3        | 24          |
| LNU964                                                                                                                                                                                                      | 0.819 | 2.41E-02 | 3        | 21          | LNU964    | 0.780 | 3.84E-02 | 3        | 38          |
| LNU964                                                                                                                                                                                                      | 0.808 | 2.77E-02 | 3        | 57          | LNU964    | 0.716 | 7.03E-02 | 3        | 41          |
| LNU964                                                                                                                                                                                                      | 0.700 | 3.57E-02 | 6        | 45          | LNU964    | 0.705 | 3.40E-02 | 6        | 38          |
| LNU965                                                                                                                                                                                                      | 0.798 | 3.15E-02 | 3        | 27          | LNU965    | 0.848 | 1.59E-02 | 3        | 26          |
| LNU966                                                                                                                                                                                                      | 0.743 | 5.59E-02 | 3        | 61          | LNU966    | 0.757 | 4.86E-02 | 3        | 57          |
| LNU967                                                                                                                                                                                                      | 0.874 | 1.01E-02 | 3        | 49          | LNU967    | 0.890 | 7.28E-03 | 3        | 3           |
| LNU967                                                                                                                                                                                                      | 0.779 | 3.88E-02 | 3        | 23          | LNU967    | 0.702 | 7.88E-02 | 3        | 61          |
| LNU967                                                                                                                                                                                                      | 0.787 | 1.18E-02 | 6        | 41          | LNU968    | 0.732 | 6.15E-02 | 3        | 27          |
| LNU969                                                                                                                                                                                                      | 0.717 | 2.98E-02 | 7        | 9           |           |       |          |          |             |

Table 46. Provided are the correlations (R) between the expression levels yield improving genes and their homologues in various tissues [Expression sets (Exp)] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector)] under abiotic stress conditions (salinity) or normal conditions across Sorghum accessions. Cor.—Correlation vector as described hereinabove (Table 38). P = p value.

## Example 7

### Production of Maize Transcriptom and High Throughput Correlation Analysis with Yield and NUE Related Parameters Using 60K Maize Oligonucleotide Micro-Arrays

In order to produce a high throughput correlation analysis between plant phenotype and gene expression level, the present inventors utilized a maize oligonucleotide micro-array, produced by Agilent Technologies [chem. (dot) agi-

55 lent (dot) com/Scripts/PDS (dot) asp?1Page=50879]. The array oligonucleotide represents about 44,000 maize genes and transcripts.

Correlation of Maize Hybrids Across Ecotypes Grown Under Regular Growth Conditions

#### Experimental Procedures

12 Maize hybrids were grown in 3 repetitive plots, in field. Maize seeds were planted and plants were grown in the field using commercial fertilization and irrigation protocols (485 metric cubes of water per dunam, 30 units of uran 21% fertilization per entire growth period). In order to define correlations between the levels of RNA expression with

stress and yield components or vigor related parameters, the 12 different maize hybrids were analyzed. Among them, 10 hybrids encompassing the observed variance were selected for RNA expression analysis. The correlation between the RNA levels and the characterized parameters was analyzed using Pearson correlation test [davidmlane (dot) com/hyperstat/A34739 (dot) html].

Analyzed Maize tissues—All 10 selected maize hybrids were sampled per 3 time points (TP2=V6-V8, TP5=R1-R2, TP6=R3-R4). Four types of plant tissues [Ear, flag leaf indicated in Table 47 as “leaf”, grain distal part, and internode] growing under Normal conditions were sampled and RNA was extracted as described above. Each micro-array expression information tissue type has received a Set ID as summarized in Table 47 below.

TABLE 47

| Maize transcriptom expression sets |        |
|------------------------------------|--------|
| Expression Set                     | Set ID |
| Maize field/Normal/Ear TP5         | 1      |
| Maize field/Normal/Ear TP6         | 2      |
| Maize field/Normal/Grain Distal    | 3      |
| Maize field/Normal/Internode TP2   | 4      |
| Maize field/Normal/Internode TP5   | 5      |
| Maize field/Normal/Internode TP6   | 6      |
| Maize field/Normal/Leaf TP2        | 7      |
| Maize field/Normal/Leaf TP5        | 8      |

Table 47: Provided are the maize transcriptom expression sets.

Leaf = the leaf below the main ear;

Flower meristem = Apical meristem following male flower initiation;

Ear = the female flower at the anthesis day.

Grain Distal = maize developing grains from the cob extreme area,

Grain Basal = maize developing grains from the cob basal area;

Internodes = internodes located above and below the main ear in the plant.

TP = time point.

The following parameters were collected using digital imaging system:

Grain Area (cm<sup>2</sup>)—At the end of the growing period the grains were separated from the ear. A sample of ~200 grains were weighted, photographed and images were processed using the below described image processing system. The grain area was measured from those images and was divided by the number of grains.

Grain Length and Grain width (cm)—At the end of the growing period the grains were separated from the ear. A sample of ~200 grains were weighted, photographed and images were processed using the below described image processing system. The sum of grain lengths/or width (longest axis) was measured from those images and was divided by the number of grains.

Ear Area (cm<sup>2</sup>)—At the end of the growing period 5 ears were, photographed and images were processed using the below described image processing system. The Ear area was measured from those images and was divided by the number of Ears.

Ear Length and Ear Width (cm)—At the end of the growing period 5 ears were, photographed and images were processed using the below described image processing system. The Ear length and width (longest axis) was measured from those images and was divided by the number of ears.

The image processing system was used, which consists of a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.37, Java based image processing software, which was developed at the U.S. National Institutes of Health and is freely available on the internet at rsbweb (dot) nih (dot) gov/. Images were captured

in resolution of 10 Mega Pixels (3888×2592 pixels) and stored in a low compression JPEG (Joint Photographic Experts Group standard) format. Next, image processing output data for seed area and seed length was saved to text files and analyzed using the JMP statistical analysis software (SAS institute).

Additional parameters were collected either by sampling 6 plants per plot or by measuring the parameter across all the plants within the plot.

Normalized Grain Weight per plant (gr.)—At the end of the experiment all ears from plots within blocks A-C were collected. Six ears were separately threshed and grains were weighted, all additional ears were threshed together and weighted as well.

The average grain weight per ear was calculated by dividing the total grain weight by number of total ears per plot (based on plot). In case of 6 ears, the total grains weight of 6 ears was divided by 6.

Ear FW (gr.)—At the end of the experiment (when ears were harvested) total and 6 selected ears per plots within blocks A-C were collected separately. The plants with (total and 6) were weighted (gr.) separately and the average ear per plant was calculated for total [Ear FW (fresh weight) per plot] and for 6 (Ear FW per plant).

Plant height and Ear height—Plants were characterized for height at harvesting. In each measure, 6 plants were measured for their height using a measuring tape. Height was measured from ground level to top of the plant below the tassel. Ear height was measured from the ground level to the place where the main ear is located.

Leaf number per plant—Plants were characterized for leaf number during growing period at 5 time points. In each measure, plants were measured for their leaf number by counting all the leaves of 3 selected plants per plot.

Relative Growth Rate was calculated using Formulas II-XIII (described above).

SPAD—Chlorophyll content was determined using a Minolta SPAD 502 chlorophyll meter and measurement was performed 64 days post sowing. SPAD meter readings were done on young fully developed leaf. Three measurements per leaf were taken per plot. Data were taken after 46 and 54 days after sowing (DPS).

Dry weight per plant—At the end of the experiment (when inflorescence were dry) all vegetative material from plots within blocks A-C were collected.

Dry weight=total weight of the vegetative portion above ground (excluding roots) after drying at 70° C. in oven for 48 hours.

Harvest Index (HI) (Maize)—The harvest index was calculated using Formula XVII above.

Percent Filled Ear [%]—was calculated as the percentage of the Ear area with grains out of the total ear.

Cob diameter [cm]—The diameter of the cob without grains was measured using a ruler.

Kernel Row Number per Ear—The number of rows in each ear was counted.

#### Experimental Results

12 different maize hybrids were grown and characterized for different parameters. The correlated parameters are described in Table 48 below. The average for each of the measured parameter was calculated using the JMP software (Tables 49-50) and a subsequent correlation analysis was performed. Results were then integrated to the database.

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TABLE 48

| Maize correlated parameters (vectors) |                |
|---------------------------------------|----------------|
| Correlated parameter with             | Correlation ID |
| Cob Diameter mm                       | 1              |
| DW per Plant based on 6 gr            | 2              |
| Ear Area cm <sup>2</sup>              | 3              |
| Ear FW per Plant based on 6 gr        | 4              |
| Ear Height cm                         | 5              |
| Ear Length cm                         | 6              |
| Ear Width cm                          | 7              |
| Ears FW per plant based on all gr     | 8              |
| Filled per Whole Ear                  | 9              |
| Grain Area cm <sup>2</sup>            | 10             |
| Grain Length cm                       | 11             |
| Grain Width cm                        | 12             |
| Growth Rate Leaf Num                  | 13             |

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TABLE 48-continued

| Maize correlated parameters (vectors)                                                           |                |
|-------------------------------------------------------------------------------------------------|----------------|
| Correlated parameter with                                                                       | Correlation ID |
| Kernel Row Number per Ear                                                                       | 14             |
| Leaf Number per Plant                                                                           | 15             |
| Normalized Grain Weight per Plant based on all gr                                               | 16             |
| Normalized Grain Weight per plant based on 6 gr                                                 | 17             |
| Percent Filled Ear                                                                              | 18             |
| Plant Height per Plot cm                                                                        | 19             |
| SPAD 46DPS TP2                                                                                  | 20             |
| SPAD 54DPS TP5                                                                                  | 21             |
| Table 48. SPAD 46DPS and SPAD 54DPS: Chlorophyll level after 46 and 54 days after sowing (DPS). |                |
| “FW” = fresh weight;                                                                            |                |
| “DW” = dry weight.                                                                              |                |

TABLE 49

| Measured parameters in Maize accessions under normal conditions |          |       |       |        |       |        |        |       |      |        |      |      |      |
|-----------------------------------------------------------------|----------|-------|-------|--------|-------|--------|--------|-------|------|--------|------|------|------|
| line ID                                                         | Corr. ID |       |       |        |       |        |        |       |      |        |      |      |      |
|                                                                 | 21       | 20    | 1     | 2      | 3     | 4      | 5      | 6     | 7    | 8      | 9    | 10   | 11   |
| Line-1                                                          | 54.28    | 51.67 | 28.96 | 657.50 | 85.06 | 245.83 | 135.17 | 19.69 | 5.58 | 278.19 | 0.92 | 0.75 | 1.17 |
| Line-2                                                          | 57.18    | 56.41 | 25.08 | 491.67 | 85.84 | 208.33 | 122.33 | 19.06 | 5.15 | 217.50 | 0.92 | 0.71 | 1.09 |
| Line-3                                                          | 56.01    | 53.55 | 28.05 | 641.11 | 90.51 | 262.22 | 131.97 | 20.52 | 5.67 | 288.28 | 0.93 | 0.76 | 1.18 |
| Line-4                                                          | 59.68    | 55.21 | 25.73 | 580.56 | 95.95 | 263.89 | 114.00 | 21.34 | 5.53 | 247.88 | 0.92 | 0.77 | 1.21 |
| Line-5                                                          | 54.77    | 55.30 | 28.72 | 655.56 | 91.62 | 272.22 | 135.28 | 20.92 | 5.73 | 280.11 | 0.91 | 0.81 | 1.23 |
| Line-6                                                          | 59.14    | 59.35 | 25.78 | 569.44 | 72.41 | 177.78 | 94.28  | 18.23 | 5.23 | 175.84 | 0.95 | 0.71 | 1.12 |
| Line-7                                                          | 57.99    | 58.48 | 26.43 | 511.11 | 74.03 | 188.89 | 120.94 | 19.02 | 5.22 | 192.47 | 0.87 | 0.71 | 1.14 |
| Line-8                                                          | 60.36    | 55.88 | 25.19 | 544.44 | 76.53 | 197.22 | 107.72 | 18.57 | 5.33 | 204.70 | 0.94 | 0.75 | 1.13 |
| Line-9                                                          | 54.77    | 52.98 |       |        |       |        |        |       |      |        |      |      |      |
| Line-10                                                         | 51.39    | 53.86 | 26.67 | 574.17 | 55.20 | 141.11 | 60.44  | 16.69 | 4.12 | 142.72 | 0.80 | 0.50 | 0.92 |
| Line-11                                                         | 61.14    | 59.75 |       | 522.22 | 95.36 | 261.11 | 112.50 | 21.70 | 5.58 | 264.24 | 0.96 | 0.76 | 1.18 |
| Line-12                                                         | 53.34    | 49.99 |       |        |       |        |        |       |      |        |      |      |      |

Table 49. Provided are the values of each of the parameters (as described above) measured in maize accessions (line ID) under regular growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 50

| Additional measured parameters in Maize accessions under normal growth conditions |          |      |       |       |        |        |       |        |
|-----------------------------------------------------------------------------------|----------|------|-------|-------|--------|--------|-------|--------|
| line ID                                                                           | Corr. ID |      |       |       |        |        |       |        |
|                                                                                   | 12       | 13   | 14    | 15    | 16     | 17     | 18    | 19     |
| Line-1                                                                            | 0.81     | 0.28 | 16.17 | 12.00 | 153.90 | 140.68 | 80.62 | 278.08 |
| Line-2                                                                            | 0.81     | 0.22 | 14.67 | 11.11 | 135.88 | 139.54 | 86.76 | 260.50 |
| Line-3                                                                            | 0.80     | 0.28 | 16.20 | 11.69 | 152.50 | 153.67 | 82.14 | 275.13 |
| Line-4                                                                            | 0.80     | 0.27 | 15.89 | 11.78 | 159.16 | 176.98 | 92.71 | 238.50 |
| Line-5                                                                            | 0.82     | 0.31 | 16.17 | 11.94 | 140.46 | 156.61 | 80.38 | 286.94 |
| Line-6                                                                            | 0.80     | 0.24 | 15.17 | 12.33 | 117.14 | 119.67 | 82.76 | 224.83 |
| Line-7                                                                            | 0.79     | 0.24 | 16.00 | 12.44 | 123.24 | 119.69 | 73.25 | 264.44 |
| Line-8                                                                            | 0.84     | 0.27 | 14.83 | 12.22 | 131.27 | 133.51 | 81.06 | 251.61 |
| Line-9                                                                            |          |      |       |       |        |        |       |        |
| Line-10                                                                           | 0.68     | 0.19 | 14.27 | 9.28  | 40.84  | 54.32  | 81.06 | 163.78 |
| Line-11                                                                           | 0.81     | 0.30 | 15.39 | 12.56 | 170.66 | 173.23 | 91.60 | 278.44 |
| Line-12                                                                           |          |      |       |       |        |        |       |        |

Table 50. Provided are the values of each of the parameters (as described above) measured in maize accessions (line ID) under regular growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 51

Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under normal conditions across maize varieties

| Gene Name | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
|-----------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| LNU811    | 0.752 | 3.14E-02 | 8        | 13          | LNU811    | 0.724 | 4.23E-02 | 8        | 11          |
| LNU811    | 0.748 | 3.30E-02 | 8        | 10          | LNU813    | 0.737 | 3.68E-02 | 5        | 12          |
| LNU813    | 0.766 | 4.48E-02 | 4        | 15          | LNU813    | 0.738 | 5.84E-02 | 4        | 19          |
| LNU813    | 0.854 | 1.44E-02 | 4        | 5           | LNU813    | 0.827 | 2.16E-02 | 4        | 8           |
| LNU813    | 0.701 | 7.96E-02 | 4        | 4           | LNU813    | 0.746 | 3.37E-02 | 8        | 11          |
| LNU813    | 0.750 | 3.19E-02 | 8        | 6           | LNU813    | 0.873 | 9.59E-04 | 6        | 20          |
| LNU813    | 0.843 | 3.53E-02 | 2        | 15          | LNU814    | 0.726 | 4.16E-02 | 5        | 11          |
| LNU814    | 0.790 | 1.97E-02 | 5        | 6           | LNU814    | 0.753 | 8.40E-02 | 4        | 1           |
| LNU814    | 0.900 | 5.74E-03 | 4        | 14          | LNU814    | 0.748 | 5.34E-02 | 4        | 6           |
| LNU814    | 0.867 | 1.15E-02 | 4        | 8           | LNU814    | 0.825 | 2.22E-02 | 4        | 4           |
| LNU814    | 0.770 | 7.34E-02 | 7        | 1           | LNU814    | 0.746 | 5.40E-02 | 7        | 14          |
| LNU814    | 0.824 | 2.28E-02 | 7        | 13          | LNU814    | 0.815 | 2.54E-02 | 7        | 6           |
| LNU814    | 0.844 | 1.70E-02 | 7        | 8           | LNU814    | 0.813 | 2.62E-02 | 7        | 4           |
| LNU814    | 0.892 | 6.99E-03 | 1        | 14          | LNU814    | 0.735 | 5.99E-02 | 1        | 8           |
| LNU814    | 0.756 | 4.94E-02 | 1        | 4           | LNU814    | 0.789 | 6.62E-03 | 6        | 6           |
| LNU814    | 0.782 | 7.51E-03 | 6        | 8           | LNU814    | 0.770 | 9.12E-03 | 6        | 4           |
| LNU814    | 0.749 | 8.63E-02 | 2        | 3           | LNU814    | 0.722 | 1.05E-01 | 2        | 16          |
| LNU814    | 0.859 | 2.84E-02 | 2        | 6           | LNU814    | 0.964 | 1.90E-03 | 2        | 9           |
| LNU814    | 0.884 | 1.94E-02 | 2        | 18          | LNU814    | 0.829 | 4.12E-02 | 2        | 17          |
| LNU815    | 0.803 | 5.42E-02 | 2        | 9           | LNU815    | 0.715 | 1.10E-01 | 2        | 18          |
| LNU816    | 0.851 | 1.52E-02 | 4        | 19          | LNU816    | 0.825 | 2.24E-02 | 4        | 5           |
| LNU816    | 0.799 | 5.66E-02 | 1        | 1           | LNU816    | 0.778 | 6.87E-02 | 2        | 12          |
| LNU818    | 0.795 | 3.26E-02 | 4        | 12          | LNU818    | 0.726 | 6.45E-02 | 1        | 14          |
| LNU818    | 0.791 | 3.42E-02 | 1        | 15          | LNU818    | 0.727 | 6.40E-02 | 1        | 11          |
| LNU818    | 0.788 | 3.54E-02 | 1        | 9           | LNU818    | 0.733 | 6.10E-02 | 1        | 10          |
| LNU818    | 0.761 | 4.68E-02 | 1        | 7           | LNU818    | 0.792 | 3.36E-02 | 1        | 12          |
| LNU818    | 0.735 | 3.76E-02 | 8        | 13          | LNU818    | 0.827 | 1.14E-02 | 8        | 11          |
| LNU818    | 0.732 | 3.88E-02 | 8        | 10          | LNU818    | 0.735 | 2.40E-02 | 3        | 15          |
| LNU819    | 0.801 | 3.02E-02 | 4        | 18          | LNU819    | 0.726 | 6.45E-02 | 1        | 3           |
| LNU819    | 0.787 | 3.58E-02 | 1        | 6           | LNU819    | 0.951 | 9.89E-04 | 1        | 18          |
| LNU820    | 0.735 | 9.57E-02 | 2        | 12          | LNU821    | 0.840 | 9.08E-03 | 5        | 3           |
| LNU821    | 0.759 | 2.90E-02 | 5        | 16          | LNU821    | 0.821 | 1.24E-02 | 5        | 11          |
| LNU821    | 0.920 | 1.22E-03 | 5        | 6           | LNU821    | 0.810 | 1.48E-02 | 5        | 4           |
| LNU821    | 0.864 | 5.63E-03 | 5        | 17          | LNU821    | 0.908 | 4.74E-03 | 1        | 14          |
| LNU821    | 0.702 | 7.86E-02 | 1        | 13          | LNU821    | 0.729 | 6.31E-02 | 1        | 6           |
| LNU821    | 0.796 | 3.23E-02 | 1        | 8           | LNU821    | 0.812 | 2.65E-02 | 1        | 4           |
| LNU821    | 0.756 | 8.20E-02 | 2        | 9           | LNU821    | 0.752 | 8.49E-02 | 2        | 18          |
| LNU822    | 0.753 | 8.42E-02 | 4        | 1           | LNU822    | 0.839 | 1.84E-02 | 4        | 2           |
| LNU822    | 0.828 | 1.10E-02 | 8        | 1           | LNU822    | 0.730 | 3.99E-02 | 8        | 14          |
| LNU822    | 0.961 | 1.45E-04 | 8        | 13          | LNU822    | 0.809 | 1.50E-02 | 8        | 11          |
| LNU822    | 0.808 | 1.53E-02 | 8        | 10          | LNU822    | 0.948 | 3.34E-04 | 8        | 2           |
| LNU822    | 0.898 | 2.48E-03 | 8        | 7           | LNU822    | 0.707 | 5.00E-02 | 8        | 8           |
| LNU823    | 0.875 | 9.86E-03 | 7        | 3           | LNU823    | 0.790 | 3.44E-02 | 7        | 16          |
| LNU823    | 0.905 | 5.13E-03 | 7        | 6           | LNU823    | 0.950 | 1.02E-03 | 7        | 18          |
| LNU823    | 0.715 | 7.07E-02 | 7        | 19          | LNU823    | 0.774 | 4.10E-02 | 7        | 8           |
| LNU823    | 0.838 | 1.86E-02 | 7        | 4           | LNU823    | 0.806 | 2.85E-02 | 7        | 17          |
| LNU823    | 0.818 | 1.31E-02 | 8        | 12          | LNU823    | 0.770 | 7.33E-02 | 2        | 9           |
| LNU824    | 0.702 | 5.24E-02 | 5        | 2           | LNU824    | 0.835 | 9.85E-03 | 5        | 12          |
| LNU824    | 0.704 | 7.74E-02 | 1        | 5           | LNU824    | 0.780 | 2.25E-02 | 3        | 1           |
| LNU824    | 0.705 | 3.39E-02 | 3        | 5           | LNU824    | 0.849 | 3.25E-02 | 2        | 12          |
| LNU825    | 0.802 | 5.48E-02 | 2        | 12          | LNU829    | 0.931 | 7.75E-04 | 8        | 1           |
| LNU829    | 0.781 | 2.22E-02 | 8        | 13          | LNU829    | 0.876 | 4.34E-03 | 8        | 19          |
| LNU829    | 0.813 | 1.42E-02 | 8        | 2           | LNU829    | 0.787 | 2.05E-02 | 8        | 5           |
| LNU829    | 0.781 | 2.21E-02 | 8        | 7           | LNU829    | 0.756 | 3.00E-02 | 8        | 8           |
| LNU830    | 0.751 | 8.50E-02 | 2        | 9           | LNU830    | 0.772 | 7.20E-02 | 2        | 18          |
| LNU831    | 0.714 | 4.67E-02 | 8        | 2           | LNU831    | 0.704 | 5.13E-02 | 8        | 7           |
| LNU831    | 0.743 | 1.39E-02 | 6        | 8           | LNU832    | 0.712 | 7.28E-02 | 7        | 3           |
| LNU832    | 0.764 | 4.57E-02 | 7        | 16          | LNU832    | 0.761 | 4.68E-02 | 7        | 11          |
| LNU832    | 0.835 | 1.93E-02 | 7        | 10          | LNU832    | 0.774 | 4.12E-02 | 7        | 19          |
| LNU832    | 0.897 | 6.13E-03 | 7        | 5           | LNU832    | 0.788 | 3.54E-02 | 7        | 7           |
| LNU832    | 0.865 | 1.20E-02 | 7        | 12          | LNU832    | 0.745 | 5.44E-02 | 7        | 17          |
| LNU832    | 0.788 | 3.54E-02 | 1        | 15          | LNU832    | 0.760 | 4.76E-02 | 1        | 13          |
| LNU832    | 0.758 | 4.85E-02 | 1        | 9           | LNU832    | 0.714 | 7.14E-02 | 1        | 10          |
| LNU832    | 0.756 | 4.91E-02 | 1        | 7           | LNU832    | 0.749 | 3.25E-02 | 8        | 12          |
| LNU832    | 0.707 | 2.22E-02 | 6        | 10          | LNU832    | 0.828 | 3.07E-03 | 6        | 12          |
| LNU832    | 0.857 | 3.15E-03 | 3        | 15          | LNU832    | 0.714 | 3.08E-02 | 3        | 10          |
| LNU832    | 0.729 | 2.59E-02 | 3        | 12          | LNU832    | 0.780 | 6.70E-02 | 2        | 12          |
| LNU833    | 0.810 | 5.08E-02 | 7        | 1           | LNU833    | 0.805 | 1.60E-02 | 8        | 1           |
| LNU833    | 0.701 | 5.27E-02 | 8        | 14          | LNU833    | 0.780 | 2.25E-02 | 8        | 2           |
| LNU833    | 0.746 | 8.84E-02 | 2        | 14          | LNU834    | 0.718 | 6.89E-02 | 4        | 3           |
| LNU834    | 0.754 | 5.05E-02 | 4        | 6           | LNU834    | 0.717 | 6.99E-02 | 4        | 10          |
| LNU834    | 0.717 | 6.96E-02 | 4        | 19          | LNU834    | 0.867 | 1.15E-02 | 4        | 5           |
| LNU834    | 0.704 | 7.77E-02 | 4        | 7           | LNU834    | 0.733 | 6.11E-02 | 4        | 8           |

TABLE 51-continued

Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under normal conditions across maize varieties

| Gene Name | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
|-----------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| LNU834    | 0.724 | 6.56E-02 | 4        | 12          | LNU834    | 0.707 | 7.58E-02 | 4        | 4           |
| LNU834    | 0.843 | 1.72E-02 | 7        | 15          | LNU834    | 0.855 | 1.42E-02 | 7        | 21          |
| LNU834    | 0.883 | 8.46E-03 | 7        | 9           | LNU834    | 0.828 | 2.14E-02 | 7        | 12          |
| LNU834    | 0.717 | 6.97E-02 | 1        | 15          | LNU834    | 0.747 | 5.38E-02 | 1        | 9           |
| LNU834    | 0.778 | 3.93E-02 | 1        | 10          | LNU834    | 0.857 | 1.36E-02 | 1        | 12          |
| LNU834    | 0.972 | 5.30E-05 | 8        | 13          | LNU834    | 0.876 | 4.37E-03 | 8        | 11          |
| LNU834    | 0.958 | 1.78E-04 | 8        | 10          | LNU834    | 0.776 | 2.35E-02 | 8        | 2           |
| LNU834    | 0.876 | 4.30E-03 | 8        | 7           | LNU834    | 0.708 | 4.92E-02 | 8        | 8           |
| LNU834    | 0.729 | 4.01E-02 | 8        | 4           | LNU834    | 0.747 | 2.09E-02 | 3        | 3           |
| LNU834    | 0.828 | 5.89E-03 | 3        | 16          | LNU834    | 0.859 | 3.03E-03 | 3        | 15          |
| LNU834    | 0.840 | 4.61E-03 | 3        | 13          | LNU834    | 0.915 | 5.41E-04 | 3        | 11          |
| LNU834    | 0.723 | 2.77E-02 | 3        | 6           | LNU834    | 0.720 | 2.88E-02 | 3        | 9           |
| LNU834    | 0.943 | 1.39E-04 | 3        | 10          | LNU834    | 0.874 | 2.06E-03 | 3        | 19          |
| LNU834    | 0.778 | 1.35E-02 | 3        | 5           | LNU834    | 0.883 | 1.63E-03 | 3        | 7           |
| LNU834    | 0.906 | 7.68E-04 | 3        | 12          | LNU834    | 0.708 | 3.28E-02 | 3        | 4           |
| LNU834    | 0.835 | 5.12E-03 | 3        | 17          | LNU834    | 0.765 | 7.62E-02 | 2        | 15          |
| LNU834    | 0.703 | 1.20E-01 | 2        | 9           | LNU834    | 0.775 | 7.00E-02 | 2        | 18          |
| LNU834    | 0.860 | 2.81E-02 | 2        | 12          | LNU835    | 0.716 | 7.01E-02 | 4        | 16          |
| LNU835    | 0.734 | 6.03E-02 | 4        | 15          | LNU835    | 0.807 | 2.83E-02 | 4        | 9           |
| LNU835    | 0.791 | 3.43E-02 | 4        | 10          | LNU835    | 0.846 | 1.64E-02 | 4        | 19          |
| LNU835    | 0.777 | 3.98E-02 | 4        | 5           | LNU835    | 0.917 | 3.64E-03 | 4        | 12          |
| LNU835    | 0.766 | 4.45E-02 | 1        | 3           | LNU835    | 0.805 | 2.89E-02 | 1        | 16          |
| LNU835    | 0.707 | 7.55E-02 | 1        | 9           | LNU835    | 0.753 | 5.07E-02 | 1        | 10          |
| LNU835    | 0.960 | 6.02E-04 | 1        | 19          | LNU835    | 0.930 | 2.38E-03 | 1        | 5           |
| LNU835    | 0.791 | 3.42E-02 | 1        | 7           | LNU835    | 0.841 | 1.77E-02 | 1        | 8           |
| LNU835    | 0.746 | 5.42E-02 | 1        | 12          | LNU835    | 0.728 | 6.34E-02 | 1        | 4           |
| LNU835    | 0.732 | 6.14E-02 | 1        | 17          | LNU835    | 0.758 | 8.07E-02 | 2        | 9           |
| LNU835    | 0.882 | 2.00E-02 | 2        | 12          | LNU837    | 0.822 | 2.32E-02 | 1        | 14          |
| LNU837    | 0.703 | 7.79E-02 | 1        | 4           | LNU837    | 0.778 | 2.31E-02 | 8        | 11          |
| LNU837    | 0.755 | 3.02E-02 | 8        | 7           | LNU837    | 0.845 | 3.40E-02 | 2        | 14          |
| LNU837    | 0.907 | 1.26E-02 | 2        | 5           | LNU838    | 0.819 | 1.29E-02 | 5        | 19          |
| LNU838    | 0.711 | 4.80E-02 | 5        | 5           | LNU838    | 0.860 | 2.80E-02 | 2        | 9           |
| LNU838    | 0.948 | 4.01E-03 | 2        | 18          | LNU839    | 0.717 | 6.99E-02 | 4        | 10          |
| LNU839    | 0.717 | 6.96E-02 | 4        | 19          | LNU839    | 0.867 | 1.15E-02 | 4        | 5           |
| LNU839    | 0.704 | 7.77E-02 | 4        | 7           | LNU839    | 0.724 | 6.56E-02 | 4        | 12          |
| LNU839    | 0.972 | 5.30E-05 | 8        | 13          | LNU839    | 0.876 | 4.37E-03 | 8        | 11          |
| LNU839    | 0.958 | 1.78E-04 | 8        | 10          | LNU839    | 0.776 | 2.35E-02 | 8        | 2           |
| LNU839    | 0.876 | 4.30E-03 | 8        | 7           | LNU839    | 0.708 | 4.92E-02 | 8        | 8           |
| LNU839    | 0.729 | 4.01E-02 | 8        | 4           | LNU839    | 0.765 | 7.62E-02 | 2        | 15          |
| LNU839    | 0.703 | 1.20E-01 | 2        | 9           | LNU839    | 0.775 | 7.00E-02 | 2        | 18          |
| LNU840    | 0.759 | 4.77E-02 | 1        | 19          | LNU840    | 0.781 | 3.80E-02 | 1        | 8           |
| LNU840    | 0.834 | 3.89E-02 | 2        | 18          | LNU841    | 0.707 | 7.55E-02 | 7        | 16          |
| LNU841    | 0.755 | 5.00E-02 | 7        | 10          | LNU841    | 0.774 | 4.10E-02 | 7        | 19          |
| LNU841    | 0.861 | 1.29E-02 | 7        | 5           | LNU841    | 0.855 | 1.43E-02 | 7        | 12          |
| LNU841    | 0.704 | 2.31E-02 | 6        | 3           | LNU841    | 0.824 | 3.36E-03 | 6        | 8           |
| LNU841    | 0.775 | 8.41E-03 | 6        | 4           | LNU843    | 0.736 | 5.94E-02 | 7        | 3           |
| LNU843    | 0.796 | 3.22E-02 | 7        | 16          | LNU843    | 0.776 | 4.03E-02 | 7        | 21          |
| LNU843    | 0.729 | 6.29E-02 | 7        | 9           | LNU843    | 0.806 | 2.85E-02 | 7        | 10          |
| LNU843    | 0.866 | 1.17E-02 | 7        | 19          | LNU843    | 0.793 | 3.33E-02 | 7        | 5           |
| LNU843    | 0.721 | 6.77E-02 | 7        | 7           | LNU843    | 0.866 | 1.18E-02 | 7        | 12          |
| LNU843    | 0.770 | 4.28E-02 | 7        | 17          | LNU843    | 0.754 | 5.02E-02 | 1        | 15          |
| LNU845    | 0.801 | 3.03E-02 | 7        | 6           | LNU845    | 0.877 | 9.48E-03 | 7        | 18          |
| LNU845    | 0.703 | 7.84E-02 | 7        | 4           | LNU845    | 0.708 | 7.51E-02 | 7        | 17          |
| LNU845    | 0.834 | 3.90E-02 | 2        | 14          | LNU845    | 0.711 | 1.13E-01 | 2        | 5           |
| LNU846    | 0.817 | 2.49E-02 | 7        | 3           | LNU846    | 0.777 | 4.00E-02 | 7        | 16          |
| LNU846    | 0.721 | 6.76E-02 | 7        | 13          | LNU846    | 0.777 | 3.97E-02 | 7        | 11          |
| LNU846    | 0.889 | 7.41E-03 | 7        | 6           | LNU846    | 0.894 | 6.59E-03 | 7        | 18          |
| LNU846    | 0.796 | 3.22E-02 | 7        | 4           | LNU846    | 0.834 | 1.97E-02 | 7        | 17          |
| LNU846    | 0.733 | 9.72E-02 | 2        | 9           | LNU846    | 0.724 | 1.04E-01 | 2        | 12          |

Table 51. Provided are the correlations (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor] components [Correlation vector (Cor)] under normal conditions across maize varieties.

P = p value.

Production of Maize Transcriptom and High  
Throughput Correlation Analysis with Yield and  
NUE Related Parameters when Grown Under  
Reduced Nitrogen Fertilization Using 60K Maize  
Oligonucleotide Micro-Arrays

In order to produce a high throughput correlation analysis between plant phenotype and gene expression level, the present inventors utilized a maize oligonucleotide micro-array, produced by Agilent Technologies [chem. (dot) agilent (dot) com/Scripts/PDS (dot) asp?1Page=50879]. The array oligonucleotide represents about 44,000 maize genes and transcripts.

Correlation of Maize Hybrids Across Ecotypes Grown Under Low Nitrogen Conditions

Experimental Procedures

12 Maize hybrids were grown in 3 repetitive plots, in field. Maize seeds were planted and plants were grown in the field using commercial fertilization and irrigation protocols (485 metric cubes of water per dunam, 30 units of urea 21% fertilization per entire growth period). In order to define correlations between the levels of RNA expression with NUE and yield components or vigor related parameters, the 12 different maize hybrids were analyzed. Among them, 11 hybrids encompassing the observed variance were selected for RNA expression analysis. The correlation between the RNA levels and the characterized parameters was analyzed using Pearson correlation test [davidmlane (dot) com/hyperstat/A34739 (dot) html].

Analyzed Maize tissues—All 10 selected maize hybrids were sampled per each treatment (low N and normal conditions), in three time points: TP2=V6-V8 (six to eight collar leaf are visible, rapid growth phase and kernel row determination begins), TP5=R1-R2 (silking-blister), TP6=R3-R4 (milk-dough). Four types of plant tissues [Ear, flag leaf indicated in Tables 52-53 as leaf, grain distal part, and internode] were sampled and RNA was extracted as described above. Each micro-array expression information tissue type has received a Set ID as summarized in Tables 52-53 below.

TABLE 52

| Maize under low N conditions transcriptom expression sets |        |
|-----------------------------------------------------------|--------|
| Expression Set                                            | Set ID |
| Maize field/Low/N/Ear/TP5                                 | 1      |
| Maize field/Low/N/Ear/TP6                                 | 2      |
| Maize field/Low/N/Internodes/TP2                          | 3      |
| Maize field/Low/N/Internodes/TP5                          | 4      |
| Maize field/Low/N/Leaf/TP5                                | 5      |
| Maize field/Low/N/Leaf/TP6                                | 6      |

Table 52: Provided are the maize transcriptom expression sets.

Leaf = the leaf below the main ear;

Flower meristem = Apical meristem following male flower initiation;

Ear = the female flower at the anthesis day.

Grain Distal = maize developing grains from the cob extreme area,

Grain Basal = maize developing grains from the cob basal area;

Internodes = internodes located above and below the main ear in the plant.

TABLE 53

| Maize under normal conditions transcriptom expression sets |                              |
|------------------------------------------------------------|------------------------------|
| Set ID                                                     | Expression Set               |
| 1                                                          | Maize field/Normal/Ear/R1-R2 |
| 2                                                          | Maize field/Normal/Ear/R3-R4 |

TABLE 53-continued

| Maize under normal conditions transcriptom expression sets |                                       |
|------------------------------------------------------------|---------------------------------------|
| Set ID                                                     | Expression Set                        |
| 3                                                          | Maize field Normal/Grain/Distal/R4-R5 |
| 4                                                          | Maize field Normal/Internode/R1-R2    |
| 5                                                          | Maize field Normal/Internode/R3-R4    |
| 6                                                          | Maize field Normal/Internode/V6-V8    |
| 7                                                          | Maize field Normal/Leaf/R1-R2         |
| 8                                                          | Maize field Normal/Leaf/V6-V8         |

Table 53: Provided are the maize transcriptom expression sets.

Leaf = the leaf below the main ear;

Flower meristem = Apical meristem following male flower initiation;

Ear = the female flower at the anthesis day.

Grain Distal = maize developing grains from the cob extreme area,

Grain Basal = maize developing grains from the cob basal area;

Internodes = internodes located above and below the main ear in the plant.

The following parameters were collected were collected either by sampling 6 plants per plot or by measuring the parameter across all the plants within the plot.

Seed yield per plant (Kg.)—At the end of the experiment all ears from plots within blocks A-C were collected. 6 ears were separately threshed and grains were weighted, all additional ears were threshed together and weighted as well. The average grain weight per ear was calculated by dividing the total grain weight by number of total ears per plot (based on plot). In case of 6 ears, the total grains weight of 6 ears was divided by 6.

Ear weight per plot (gr.)—At the end of the experiment (when ears were harvested) total and 6 selected ears per plots within blocks were collected separately. The plants with (total and 6) were weighted (gr.) separately and the average ear per plant was calculated for Ear weight per plot (total of 42 plants per plot).

Plant height and Ear height—Plants were characterized for height at harvesting. In each measure, 6 plants were measured for their height using a measuring tape. Height was measured from ground level to top of the plant below the tassel. Ear height was measured from the ground level to the place where the main ear is located.

Leaf number per plant—Plants were characterized for leaf number during growing period at 5 time points. In each measure, plants were measured for their leaf number by counting all the leaves of 3 selected plants per plot.

SPAD—Chlorophyll content was determined using a Minolta SPAD 502 chlorophyll meter and measurement was performed 64 days post sowing. SPAD meter readings were done on young fully developed leaf. Seven measurements per leaf were taken per plot. Data were taken after once per weeks after sowing.

Dry weight per plant—At the end of the experiment (when Inflorescence were dry) all vegetative material from plots within blocks A-C were collected.

Dry weight=total weight of the vegetative portion above ground (excluding roots) after drying at 70° C. in oven for 48 hours;

Ear length of Filled Ear [cm]—it was calculated as the length of the ear with grains out of the total ear.

Ear length and width [cm]—it was calculated as the length and width of the ear in the filled. Measurement was performed in 6 plants per each plot.

Kernel Row Number per Ear—The number of rows in each ear was counted.

Stalk width [cm]—The diameter of the stalk was measured in the internode located below the main ear. Measurement was performed in 6 plants per each plot.

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Leaf area index [LAI]=total leaf area of all plants in a plot. Measurement was performed using a Leaf area-meter.

NUE [kg/kg]—is the ratio between total grain yield per total N applied in soil.

NUpE [kg/kg]—is the ratio between total plant biomass per total N applied in soil.

Yield/stalk width [kg/cm]—is the ratio between total grain yields and the width of the stalk.

Yield/LAI [kg]—is the ratio between total grain yields and total leaf area index.

## Experimental Results

11 different maize hybrids were grown and characterized for different parameters. Tables 54-55 describe the Maize correlated parameters. The average for each of the measured parameter was calculated using the JMP software (Tables 56-59) and a subsequent correlation analysis was performed (Tables 60-61). Results were then integrated to the database.

TABLE 54

| Maize under low N conditions correlated parameters (vectors) |                                                                      |
|--------------------------------------------------------------|----------------------------------------------------------------------|
| Correlation ID                                               | Correlated parameter with                                            |
| 1                                                            | Low N—Ear Length [cm]                                                |
| 2                                                            | Low N—Ear length of filled area [cm]                                 |
| 3                                                            | Low N—Ear with [mm]                                                  |
| 4                                                            | Low N—Final Leaf Number                                              |
| 5                                                            | Low N—Final Main Ear Height [cm]                                     |
| 6                                                            | Low N—Final Plant Height [cm]                                        |
| 7                                                            | Low N—No of rows per ear                                             |
| 8                                                            | Low N—SPAD R1-2                                                      |
| 9                                                            | Low N—SPAD R3-R4                                                     |
| 10                                                           | Low N—Stalk width 20/08/09 close to TP5 [cm]                         |
| 11                                                           | Low N—Ear weight per plot<br>( 42 plants per plot) [0 RH] [kg]       |
| 12                                                           | Low N—Final Plant DW [kg]                                            |
| 13                                                           | Low N—LAI                                                            |
| 14                                                           | Low N—NUE yield kg/N applied in soil kg                              |
| 15                                                           | Low N—NUE at early grain filling<br>[R1-R2] yield Kg/N in plant SPAD |
| 16                                                           | Low N—NUE at grain filling [R3-R4]<br>yield Kg/N in plant SPAD       |
| 17                                                           | Low N—NUpE [biomass/N applied]                                       |
| 18                                                           | Low N—Seed yield per dunam [kg]                                      |
| 19                                                           | Low N—Yield/LAI                                                      |

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TABLE 54-continued

| Maize under low N conditions correlated parameters (vectors) |                                                               |
|--------------------------------------------------------------|---------------------------------------------------------------|
| Correlation ID                                               | Correlated parameter with                                     |
| 20                                                           | Low N—Yield/stalk width                                       |
| 21                                                           | Low N—seed yield per 1 plant rest<br>of the plot [0-RH in Kg] |

Table 54. “cm” = centimeters’

“mm” = millimeters;

“kg” = kilograms;

SPAD at R1-R2 and SPAD R3-R4: Chlorophyll level after early and late stages of grain filling;

“NUE” = nitrogen use efficiency;

“NUpE” = nitrogen uptake efficiency;

“LAI” = leaf area;

“N” = nitrogen;

Low N = under low Nitrogen conditions;

“Normal” = under normal conditions;

“dunam” = 1000 m<sup>2</sup>.

TABLE 55

| Maize under normal conditions correlated parameters (vectors) |                                                                       |
|---------------------------------------------------------------|-----------------------------------------------------------------------|
| Correlation ID                                                | Correlated parameter with                                             |
| 1                                                             | Normal—Final Plant DW [kg]                                            |
| 2                                                             | Normal—Ear Length [cm]                                                |
| 3                                                             | Normal—Ear length of filled area [cm]                                 |
| 4                                                             | Normal—Ear with [mm]                                                  |
| 5                                                             | Normal—Final Leaf Number [number]                                     |
| 6                                                             | Normal—Final Main Ear Height [cm]                                     |
| 7                                                             | Normal—Final Plant Height [cm]                                        |
| 8                                                             | Normal—No of rows per ear                                             |
| 9                                                             | Normal—SPAD R1-2                                                      |
| 10                                                            | Normal—SPAD R3-R4                                                     |
| 11                                                            | Normal—Stalk width TP5 [mm]                                           |
| 12                                                            | Normal—Ear weight per plot [kg]                                       |
| 13                                                            | Normal—LAI                                                            |
| 14                                                            | Normal—NUE yield kg/N applied in soil kg                              |
| 15                                                            | Normal—NUE at early grain filling<br>[R1-R2] yield Kg/N in plant SPAD |
| 16                                                            | Normal—NUE at grain filling [R3-R4]<br>yield Kg/N in plant SPAD       |
| 17                                                            | Normal—NUpE [biomass/N applied]                                       |
| 18                                                            | Normal—Seed yield per dunam [kg]                                      |
| 19                                                            | Normal—Yield/LAI                                                      |
| 20                                                            | Normal—Yield/stalk width                                              |
| 21                                                            | Normal—seed yield per 1 plant rest<br>of the plot [0-RH in Kg]        |

Table 55. “cm” = centimeters’

“mm” = millimeters;

“kg” = kilograms;

SPAD at R1-R2 and SPAD R3-R4: Chlorophyll level after early and late stages of grain filling;

“NUE” = nitrogen use efficiency;

“NUpE” = nitrogen uptake efficiency;

“LAI” = leaf area;

“N” = nitrogen;

Low N = under low Nitrogen conditions;

“Normal” = under normal conditions;

“dunam” = 1000 m<sup>2</sup>.

TABLE 56

| Measured parameters in Maize accessions under normal conditions |       |        |        |        |        |         |         |        |        |        |          |
|-----------------------------------------------------------------|-------|--------|--------|--------|--------|---------|---------|--------|--------|--------|----------|
|                                                                 |       |        |        |        |        |         |         |        |        |        | Corr. ID |
| Line                                                            | 1     | 2      | 3      | 4      | 5      | 6       | 7       | 8      | 9      | 10     | 11       |
| Line-1                                                          | 1.267 | 19.944 | 16.233 | 51.075 | 11.800 | 130.311 | 273.456 | 16.11  | 56.889 | 59.933 | 2.911    |
| Line-2                                                          | 1.300 | 20.167 | 17.500 | 46.290 | 11.111 | 122.333 | 260.500 | 14.667 | 57.161 | 60.900 | 2.644    |
| Line-3                                                          | 1.333 | 18.111 | 17.722 | 45.919 | 13.278 | 127.667 | 288.000 | 15.444 | 59.272 | 56.892 | 2.711    |
| Line-4                                                          | 1.500 | 19.889 | 18.444 | 47.632 | 11.778 | 113.022 | 238.500 | 15.889 | 61.611 | 58.700 | 2.900    |

TABLE 56-continued

| Measured parameters in Maize accessions under normal conditions |          |        |        |        |        |         |         |        |        |        |       |
|-----------------------------------------------------------------|----------|--------|--------|--------|--------|---------|---------|--------|--------|--------|-------|
| Line                                                            | Corr. ID |        |        |        |        |         |         |        |        |        |       |
|                                                                 | 1        | 2      | 3      | 4      | 5      | 6       | 7       | 8      | 9      | 10     | 11    |
| Line-5                                                          | 1.300    | 19.500 | 15.667 | 51.407 | 11.944 | 135.278 | 286.944 | 16.167 | 58.628 | 58.700 | 2.700 |
| Line-6                                                          | 1.583    | 17.722 | 14.667 | 47.420 | 12.333 | 94.278  | 224.833 | 15.167 | 61.228 | 63.158 | 2.622 |
| Line-7                                                          | 1.417    | 17.667 | 12.944 | 47.253 | 12.444 | 120.944 | 264.444 | 16.000 | 60.167 | 59.750 | 2.922 |
| Line-8                                                          | 1.367    | 17.278 | 14.028 | 46.846 | 12.222 | 107.722 | 251.611 | 14.833 | 61.089 | 62.350 | 2.722 |
| Line-9                                                          | 11.383   | 20.500 | 18.778 | 49.275 | 12.556 | 112.500 | 278.444 | 15.389 | 62.200 | 61.925 | 2.844 |
| Line-10                                                         | 1.700    | 17.500 | 12.333 | 48.283 | 11.667 | 139.667 | 279.000 | 17.667 | 57.506 | 57.225 | 2.656 |
| Line-11                                                         | 0.417    | 19.856 | 16.067 | 41.837 | 9.278  | 60.444  | 163.778 | 14.267 | 52.044 | 49.342 | 2.256 |

Table 56. Provided are the values of each of the parameters (as described above) measured in maize accessions (line ID) under normal conditions. Growth conditions are specified in the experimental procedure section.

TABLE 57

| Additional Measured parameters in Maize accessions under normal conditions |          |       |        |        |       |          |         |       |       |         |
|----------------------------------------------------------------------------|----------|-------|--------|--------|-------|----------|---------|-------|-------|---------|
| Line                                                                       | Corr. ID |       |        |        |       |          |         |       |       |         |
|                                                                            | 12       | 14    | 15     | 16     | 17    | 18       | 20      | 21    | 13    | 19      |
| Line-1                                                                     | 8.943    | 4.452 | 23.431 | 24.978 | 0.008 | 1335.625 | 456.707 | 0.167 | 3.208 | 426.086 |
| Line-2                                                                     | 7.023    | 3.624 | 19.052 | 17.807 | 0.009 | 1087.058 | 412.443 | 0.136 | 3.947 | 312.975 |
| Line-3                                                                     | 7.533    | 4.008 | 20.293 | 20.332 | 0.009 | 1202.532 | 443.368 | 0.150 | 3.332 | 307.277 |
| Line-4                                                                     | 7.991    | 4.237 | 20.719 | 19.957 | 0.010 | 1271.204 | 438.705 | 0.159 | 4.012 | 362.442 |
| Line-5                                                                     | 8.483    | 4.010 | 20.486 | 19.026 | 0.009 | 1202.966 | 446.659 | 0.150 | 3.864 | 314.138 |
| Line-6                                                                     | 5.632    | 3.124 | 15.360 | 13.904 | 0.011 | 937.083  | 356.950 | 0.117 | 4.191 | 224.582 |
| Line-7                                                                     | 6.100    | 3.286 | 16.383 | 16.234 | 0.009 | 985.893  | 337.486 | 0.123 | 3.969 | 266.437 |
| Line-8                                                                     | 6.659    | 3.500 | 17.191 | 17.214 | 0.009 | 1050.131 | 385.790 | 0.131 | 4.322 | 261.664 |
| Line-9                                                                     | 8.402    | 4.551 | 21.955 | 21.017 | 0.076 | 1365.293 | 481.942 | 0.171 | 2.888 | 482.329 |
| Line-10                                                                    | 8.215    | 4.087 | 20.994 | 21.529 | 0.004 | 1226.077 | 471.568 | 0.153 | 4.306 |         |
| Line-11                                                                    | 1.879    | 1.003 | 5.725  | 5.519  | 0.003 | 300.928  | 139.728 | 0.038 |       |         |

Table 57. Provided are the values of each of the parameters (as described above) measured in maize accessions (line ID) under normal conditions. Growth conditions are specified in the experimental procedure section.

TABLE 58

| Measured parameters in Maize accessions under low Nitrogen conditions |          |        |        |        |         |         |        |        |        |       |        |
|-----------------------------------------------------------------------|----------|--------|--------|--------|---------|---------|--------|--------|--------|-------|--------|
| Line                                                                  | Corr. ID |        |        |        |         |         |        |        |        |       |        |
|                                                                       | 1        | 2      | 3      | 4      | 5       | 6       | 7      | 8      | 9      | 10    | 11     |
| Line-1                                                                | 20.614   | 18.398 | 46.713 | 15.024 | 158.076 | 305.836 | 14.181 | 60.236 | 59.286 | 2.764 | 6.605  |
| Line-2                                                                | 20.976   | 18.417 | 48.222 | 11.643 | 136.238 | 270.929 | 15.214 | 57.938 | 57.621 | 2.419 | 7.974  |
| Line-3                                                                | 20.222   | 19.778 | 48.323 | 13.500 | 128.389 | 290.611 | 15.000 | 58.761 | 58.400 | 2.650 | 9.634  |
| Line-4                                                                | 20.111   | 18.833 | 49.863 | 11.611 | 133.056 | 252.167 | 15.667 | 59.478 | 59.189 | 2.767 | 9.222  |
| Line-5                                                                | 20.111   | 16.222 | 52.873 | 11.833 | 137.833 | 260.222 | 16.000 | 58.500 | 58.194 | 2.672 | 7.630  |
| Line-6                                                                | 18.500   | 16.000 | 47.436 | 11.889 | 99.556  | 227.222 | 15.944 | 64.039 | 62.667 | 2.594 | 7.215  |
| Line-7                                                                | 19.056   | 15.278 | 49.609 | 12.556 | 130.167 | 271.722 | 15.556 | 56.422 | 61.044 | 2.983 | 7.917  |
| Line-8                                                                | 18.250   | 15.694 | 48.567 | 11.667 | 114.611 | 248.611 | 14.500 | 60.000 | 59.867 | 2.611 | 28.961 |
| Line-9                                                                | 20.095   | 16.771 | 52.406 | 12.443 | 143.862 | 279.329 | 16.410 | 58.317 | 57.467 | 2.650 | 7.797  |
| Line-10                                                               | 17.806   | 14.056 | 42.634 | 9.278  | 61.611  | 171.278 | 14.367 | 53.061 | 49.611 | 2.278 | 2.410  |
| Line-11                                                               | 21.250   | 19.556 | 50.003 | 13.167 | 114.444 | 269.778 | 15.744 | 61.717 | 61.867 | 2.817 | 9.775  |

Table 58: Provided are the values of each of the parameters (as described above) measured in maize accessions (line ID) under low nitrogen conditions. Growth conditions are specified in the experimental procedure section.

TABLE 59

| Additional measured parameters in Maize accessions under low Nitrogen conditions |          |        |        |        |       |          |         |       |       |         |
|----------------------------------------------------------------------------------|----------|--------|--------|--------|-------|----------|---------|-------|-------|---------|
| Line                                                                             | Corr. ID |        |        |        |       |          |         |       |       |         |
|                                                                                  | 12       | 14     | 15     | 16     | 17    | 18       | 20      | 21    | 13    | 19      |
| Line-1                                                                           | 1.593    | 7.225  | 18.023 | 18.352 | 0.011 | 1083.749 | 416.532 | 0.135 | 2.923 | 341.501 |
| Line-2                                                                           | 1.429    | 8.411  | 21.787 | 21.919 | 0.010 | 1261.635 | 528.383 | 0.158 | 3.155 | 408.093 |
| Line-3                                                                           | 1.533    | 10.328 | 26.335 | 26.479 | 0.010 | 1549.245 | 583.458 | 0.194 | 3.330 | 464.768 |

TABLE 59-continued

| Additional measured parameters in Maize accessions under low Nitrogen conditions |       |        |        |        |       |          |         |       |       |         |
|----------------------------------------------------------------------------------|-------|--------|--------|--------|-------|----------|---------|-------|-------|---------|
| Corr. ID                                                                         |       |        |        |        |       |          |         |       |       |         |
| Line                                                                             | 12    | 14     | 15     | 16     | 17    | 18       | 20      | 21    | 13    | 19      |
| Line-4                                                                           | 1.950 | 9.986  | 25.144 | 25.333 | 0.013 | 1497.865 | 541.017 | 0.187 | 2.873 | 522.258 |
| Line-5                                                                           | 1.483 | 7.626  | 19.547 | 19.685 | 0.010 | 1143.850 | 428.089 | 0.143 | 2.786 | 439.525 |
| Line-6                                                                           | 1.600 | 7.728  | 18.049 | 18.541 | 0.011 | 1159.260 | 444.294 | 0.145 | 3.764 | 312.581 |
| Line-7                                                                           | 1.583 | 8.049  | 21.388 | 19.785 | 0.011 | 1207.424 | 407.200 | 0.151 | 3.499 | 345.901 |
| Line-8                                                                           | 1.283 | 8.334  | 20.788 | 20.917 | 0.009 | 1250.052 | 477.438 | 0.156 | 5.016 | 287.735 |
| Line-9                                                                           | 1.514 | 7.640  | 19.676 | 19.935 | 0.010 | 1146.036 | 445.604 | 0.143 |       |         |
| Line-10                                                                          | 0.433 | 2.555  | 7.213  | 7.722  | 0.003 | 383.219  | 167.902 | 0.048 |       |         |
| Line-11                                                                          | 1.517 | 10.599 | 25.702 | 25.902 | 0.010 | 1589.914 | 562.294 | 0.199 | 3.157 | 501.239 |

Table 59: Provided are the values of each of the parameters (as described above) measured in maize accessions (line ID) under low nitrogen conditions. Growth conditions are specified in the experimental procedure section.

TABLE 60

| Correlation between the expression level of selected genes of some<br>embodiments of the invention in various tissues and the phenotypic<br>performance under normal conditions across maize varieties |       |          |             |                   |              |       |          |             |                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|-------------|-------------------|--------------|-------|----------|-------------|-------------------|
| Gene<br>Name                                                                                                                                                                                           | R     | P value  | Exp.<br>set | Cor.<br>Set<br>ID | Gene<br>Name | R     | P value  | Exp.<br>set | Cor.<br>Set<br>ID |
| LNU811                                                                                                                                                                                                 | 0.880 | 2.07E-02 | 1           | 13                | LNU811       | 0.809 | 5.10E-02 | 5           | 13                |
| LNU811                                                                                                                                                                                                 | 0.748 | 3.29E-02 | 2           | 12                | LNU811       | 0.896 | 2.58E-03 | 2           | 4                 |
| LNU811                                                                                                                                                                                                 | 0.814 | 1.39E-02 | 2           | 8                 | LNU811       | 0.855 | 3.02E-02 | 6           | 13                |
| LNU813                                                                                                                                                                                                 | 0.945 | 4.45E-03 | 5           | 5                 | LNU813       | 0.934 | 6.46E-03 | 5           | 10                |
| LNU813                                                                                                                                                                                                 | 0.825 | 4.34E-02 | 5           | 9                 | LNU813       | 0.718 | 4.48E-02 | 2           | 17                |
| LNU813                                                                                                                                                                                                 | 0.757 | 2.96E-02 | 2           | 11                | LNU813       | 0.718 | 4.48E-02 | 2           | 1                 |
| LNU813                                                                                                                                                                                                 | 0.747 | 5.37E-02 | 4           | 17                | LNU813       | 0.747 | 5.37E-02 | 4           | 1                 |
| LNU813                                                                                                                                                                                                 | 0.849 | 7.73E-03 | 3           | 10                | LNU813       | 0.809 | 2.74E-02 | 6           | 7                 |
| LNU813                                                                                                                                                                                                 | 0.704 | 7.72E-02 | 6           | 10                | LNU813       | 0.701 | 7.93E-02 | 6           | 16                |
| LNU813                                                                                                                                                                                                 | 0.851 | 1.52E-02 | 6           | 6                 | LNU813       | 0.743 | 5.58E-02 | 6           | 9                 |
| LNU814                                                                                                                                                                                                 | 0.766 | 4.47E-02 | 1           | 8                 | LNU814       | 0.976 | 8.47E-04 | 5           | 17                |
| LNU814                                                                                                                                                                                                 | 0.713 | 1.11E-01 | 5           | 3                 | LNU814       | 0.976 | 8.47E-04 | 5           | 1                 |
| LNU814                                                                                                                                                                                                 | 0.725 | 1.03E-01 | 5           | 9                 | LNU814       | 0.702 | 1.20E-01 | 5           | 19                |
| LNU814                                                                                                                                                                                                 | 0.745 | 3.41E-02 | 2           | 11                | LNU814       | 0.718 | 6.94E-02 | 4           | 3                 |
| LNU814                                                                                                                                                                                                 | 0.757 | 4.90E-02 | 4           | 6                 | LNU814       | 0.847 | 1.61E-02 | 4           | 8                 |
| LNU814                                                                                                                                                                                                 | 0.711 | 7.30E-02 | 6           | 8                 | LNU815       | 0.736 | 3.72E-02 | 2           | 10                |
| LNU815                                                                                                                                                                                                 | 0.845 | 8.22E-03 | 3           | 12                | LNU815       | 0.833 | 1.02E-02 | 3           | 15                |
| LNU815                                                                                                                                                                                                 | 0.761 | 2.83E-02 | 3           | 14                | LNU815       | 0.877 | 4.20E-03 | 3           | 4                 |
| LNU815                                                                                                                                                                                                 | 0.881 | 3.87E-03 | 3           | 16                | LNU815       | 0.761 | 2.83E-02 | 3           | 18                |
| LNU815                                                                                                                                                                                                 | 0.761 | 2.83E-02 | 3           | 21                | LNU815       | 0.725 | 4.20E-02 | 3           | 19                |
| LNU815                                                                                                                                                                                                 | 0.794 | 1.87E-02 | 7           | 13                | LNU816       | 0.807 | 5.22E-02 | 1           | 19                |
| LNU816                                                                                                                                                                                                 | 0.710 | 7.39E-02 | 1           | 2                 | LNU816       | 0.945 | 4.48E-03 | 5           | 13                |
| LNU816                                                                                                                                                                                                 | 0.711 | 4.80E-02 | 2           | 10                | LNU816       | 0.866 | 2.58E-02 | 4           | 13                |
| LNU816                                                                                                                                                                                                 | 0.705 | 5.09E-02 | 3           | 5                 | LNU816       | 0.833 | 2.01E-02 | 6           | 7                 |
| LNU816                                                                                                                                                                                                 | 0.738 | 5.82E-02 | 6           | 16                | LNU816       | 0.726 | 6.47E-02 | 6           | 6                 |
| LNU816                                                                                                                                                                                                 | 0.816 | 7.34E-03 | 7           | 11                | LNU816       | 0.759 | 1.78E-02 | 7           | 9                 |
| LNU817                                                                                                                                                                                                 | 0.728 | 1.01E-01 | 5           | 11                | LNU818       | 0.708 | 7.51E-02 | 1           | 12                |
| LNU818                                                                                                                                                                                                 | 0.731 | 6.18E-02 | 1           | 11                | LNU818       | 0.879 | 9.14E-03 | 1           | 5                 |
| LNU818                                                                                                                                                                                                 | 0.719 | 6.85E-02 | 1           | 14                | LNU818       | 0.907 | 4.80E-03 | 1           | 4                 |
| LNU818                                                                                                                                                                                                 | 0.937 | 1.84E-03 | 1           | 10                | LNU818       | 0.719 | 6.85E-02 | 1           | 18                |
| LNU818                                                                                                                                                                                                 | 0.719 | 6.85E-02 | 1           | 21                | LNU818       | 0.814 | 2.60E-02 | 1           | 9                 |
| LNU818                                                                                                                                                                                                 | 0.721 | 6.75E-02 | 1           | 20                | LNU818       | 0.741 | 9.18E-02 | 5           | 11                |
| LNU818                                                                                                                                                                                                 | 0.796 | 5.80E-02 | 5           | 10                | LNU818       | 0.766 | 7.60E-02 | 5           | 8                 |
| LNU818                                                                                                                                                                                                 | 0.758 | 2.94E-02 | 2           | 4                 | LNU818       | 0.789 | 2.00E-02 | 3           | 10                |
| LNU818                                                                                                                                                                                                 | 0.869 | 2.47E-02 | 6           | 13                | LNU818       | 0.700 | 7.98E-02 | 6           | 11                |
| LNU818                                                                                                                                                                                                 | 0.758 | 4.81E-02 | 6           | 10                | LNU818       | 0.805 | 8.91E-03 | 7           | 10                |
| LNU818                                                                                                                                                                                                 | 0.801 | 9.46E-03 | 7           | 9                 | LNU819       | 0.772 | 4.19E-02 | 1           | 3                 |
| LNU819                                                                                                                                                                                                 | 0.770 | 7.32E-02 | 1           | 19                | LNU819       | 0.773 | 4.15E-02 | 1           | 2                 |
| LNU819                                                                                                                                                                                                 | 0.813 | 4.92E-02 | 5           | 5                 | LNU819       | 0.722 | 1.83E-02 | 8           | 7                 |
| LNU819                                                                                                                                                                                                 | 0.769 | 9.28E-03 | 8           | 5                 | LNU819       | 0.709 | 2.18E-02 | 8           | 6                 |
| LNU819                                                                                                                                                                                                 | 0.742 | 5.64E-02 | 4           | 10                | LNU819       | 0.713 | 4.73E-02 | 3           | 17                |
| LNU819                                                                                                                                                                                                 | 0.713 | 4.73E-02 | 3           | 1                 | LNU819       | 0.727 | 6.44E-02 | 6           | 4                 |
| LNU820                                                                                                                                                                                                 | 0.714 | 4.66E-02 | 3           | 3                 | LNU820       | 0.749 | 3.25E-02 | 3           | 2                 |
| LNU821                                                                                                                                                                                                 | 0.702 | 7.87E-02 | 1           | 5                 | LNU821       | 0.753 | 5.08E-02 | 1           | 8                 |
| LNU822                                                                                                                                                                                                 | 0.824 | 1.18E-02 | 7           | 13                | LNU823       | 0.705 | 7.67E-02 | 4           | 11                |
| LNU823                                                                                                                                                                                                 | 0.879 | 9.16E-03 | 4           | 3                 | LNU823       | 0.795 | 3.25E-02 | 4           | 8                 |
| LNU823                                                                                                                                                                                                 | 0.812 | 4.97E-02 | 4           | 19                | LNU823       | 0.717 | 4.54E-02 | 3           | 9                 |
| LNU823                                                                                                                                                                                                 | 0.710 | 7.37E-02 | 6           | 17                | LNU823       | 0.710 | 7.37E-02 | 6           | 1                 |
| LNU823                                                                                                                                                                                                 | 0.702 | 3.50E-02 | 7           | 9                 | LNU824       | 0.704 | 7.74E-02 | 1           | 6                 |
| LNU824                                                                                                                                                                                                 | 0.791 | 1.93E-02 | 2           | 11                | LNU824       | 0.764 | 2.72E-02 | 2           | 9                 |
| LNU824                                                                                                                                                                                                 | 0.754 | 1.89E-02 | 7           | 6                 | LNU825       | 0.725 | 4.18E-02 | 2           | 4                 |

TABLE 60-continued

| Correlation between the expression level of selected genes of some<br>embodiments of the invention in various tissues and the phenotypic<br>performance under normal conditions across maize varieties |       |          |             |                   |              |       |          |             |                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|-------------|-------------------|--------------|-------|----------|-------------|-------------------|
| Gene<br>Name                                                                                                                                                                                           | R     | P value  | Exp.<br>set | Cor.<br>Set<br>ID | Gene<br>Name | R     | P value  | Exp.<br>set | Cor.<br>Set<br>ID |
| LNU825                                                                                                                                                                                                 | 0.706 | 5.04E-02 | 3           | 2                 | LNU828       | 0.829 | 4.12E-02 | 5           | 5                 |
| LNU829                                                                                                                                                                                                 | 0.894 | 2.72E-03 | 2           | 7                 | LNU829       | 0.771 | 2.52E-02 | 2           | 6                 |
| LNU829                                                                                                                                                                                                 | 0.907 | 7.49E-04 | 7           | 17                | LNU829       | 0.907 | 7.49E-04 | 7           | 1                 |
| LNU830                                                                                                                                                                                                 | 0.862 | 2.73E-02 | 5           | 9                 | LNU830       | 0.738 | 3.67E-02 | 2           | 11                |
| LNU831                                                                                                                                                                                                 | 0.790 | 3.44E-02 | 4           | 3                 | LNU832       | 0.734 | 6.02E-02 | 1           | 7                 |
| LNU832                                                                                                                                                                                                 | 0.932 | 2.24E-03 | 1           | 5                 | LNU832       | 0.714 | 1.11E-01 | 5           | 10                |
| LNU832                                                                                                                                                                                                 | 0.778 | 3.92E-02 | 4           | 7                 | LNU832       | 0.809 | 2.74E-02 | 4           | 12                |
| LNU832                                                                                                                                                                                                 | 0.747 | 5.34E-02 | 4           | 11                | LNU832       | 0.814 | 2.60E-02 | 4           | 15                |
| LNU832                                                                                                                                                                                                 | 0.780 | 3.86E-02 | 4           | 14                | LNU832       | 0.822 | 2.33E-02 | 4           | 16                |
| LNU832                                                                                                                                                                                                 | 0.917 | 3.65E-03 | 4           | 6                 | LNU832       | 0.780 | 3.86E-02 | 4           | 18                |
| LNU832                                                                                                                                                                                                 | 0.780 | 3.86E-02 | 4           | 21                | LNU832       | 0.803 | 2.98E-02 | 4           | 20                |
| LNU832                                                                                                                                                                                                 | 0.722 | 6.68E-02 | 6           | 5                 | LNU832       | 0.703 | 3.48E-02 | 7           | 11                |
| LNU832                                                                                                                                                                                                 | 0.809 | 8.29E-03 | 7           | 5                 | LNU832       | 0.709 | 3.24E-02 | 7           | 10                |
| LNU832                                                                                                                                                                                                 | 0.795 | 1.05E-02 | 7           | 9                 | LNU833       | 0.843 | 3.50E-02 | 5           | 5                 |
| LNU833                                                                                                                                                                                                 | 0.728 | 1.01E-01 | 5           | 4                 | LNU833       | 0.789 | 1.99E-02 | 2           | 5                 |
| LNU833                                                                                                                                                                                                 | 0.823 | 3.43E-03 | 8           | 10                | LNU833       | 0.710 | 7.40E-02 | 4           | 3                 |
| LNU833                                                                                                                                                                                                 | 0.721 | 4.37E-02 | 3           | 10                | LNU833       | 0.740 | 9.27E-02 | 6           | 13                |
| LNU833                                                                                                                                                                                                 | 0.702 | 7.84E-02 | 6           | 10                | LNU833       | 0.884 | 3.56E-03 | 7           | 13                |
| LNU834                                                                                                                                                                                                 | 0.935 | 6.23E-03 | 1           | 13                | LNU834       | 0.847 | 1.62E-02 | 1           | 10                |
| LNU834                                                                                                                                                                                                 | 0.754 | 5.01E-02 | 1           | 9                 | LNU834       | 0.853 | 3.08E-02 | 5           | 4                 |
| LNU834                                                                                                                                                                                                 | 0.804 | 5.40E-02 | 5           | 10                | LNU834       | 0.712 | 1.13E-01 | 5           | 19                |
| LNU834                                                                                                                                                                                                 | 0.807 | 5.22E-02 | 5           | 2                 | LNU834       | 0.707 | 5.00E-02 | 2           | 8                 |
| LNU834                                                                                                                                                                                                 | 0.727 | 1.73E-02 | 8           | 15                | LNU834       | 0.731 | 1.64E-02 | 8           | 16                |
| LNU834                                                                                                                                                                                                 | 0.735 | 2.42E-02 | 8           | 19                | LNU834       | 0.792 | 3.39E-02 | 4           | 4                 |
| LNU834                                                                                                                                                                                                 | 0.947 | 1.20E-03 | 4           | 10                | LNU834       | 0.871 | 1.07E-02 | 6           | 17                |
| LNU834                                                                                                                                                                                                 | 0.720 | 6.82E-02 | 6           | 4                 | LNU834       | 0.820 | 2.38E-02 | 6           | 6                 |
| LNU834                                                                                                                                                                                                 | 0.871 | 1.07E-02 | 6           | 1                 | LNU834       | 0.825 | 4.33E-02 | 6           | 19                |
| LNU834                                                                                                                                                                                                 | 0.706 | 7.62E-02 | 6           | 20                | LNU834       | 0.779 | 1.33E-02 | 7           | 7                 |
| LNU834                                                                                                                                                                                                 | 0.801 | 9.44E-03 | 7           | 12                | LNU834       | 0.716 | 3.00E-02 | 7           | 11                |
| LNU834                                                                                                                                                                                                 | 0.742 | 2.22E-02 | 7           | 15                | LNU834       | 0.768 | 1.57E-02 | 7           | 14                |
| LNU834                                                                                                                                                                                                 | 0.853 | 3.46E-03 | 7           | 4                 | LNU834       | 0.712 | 3.13E-02 | 7           | 10                |
| LNU834                                                                                                                                                                                                 | 0.761 | 1.73E-02 | 7           | 6                 | LNU834       | 0.768 | 1.57E-02 | 7           | 18                |
| LNU834                                                                                                                                                                                                 | 0.768 | 1.57E-02 | 7           | 21                | LNU834       | 0.764 | 1.65E-02 | 7           | 20                |
| LNU835                                                                                                                                                                                                 | 0.966 | 3.91E-04 | 1           | 7                 | LNU835       | 0.793 | 3.32E-02 | 1           | 12                |
| LNU835                                                                                                                                                                                                 | 0.743 | 5.55E-02 | 1           | 5                 | LNU835       | 0.816 | 2.52E-02 | 1           | 15                |
| LNU835                                                                                                                                                                                                 | 0.778 | 3.92E-02 | 1           | 14                | LNU835       | 0.836 | 1.91E-02 | 1           | 16                |
| LNU835                                                                                                                                                                                                 | 0.915 | 3.86E-03 | 1           | 6                 | LNU835       | 0.778 | 3.92E-02 | 1           | 18                |
| LNU835                                                                                                                                                                                                 | 0.778 | 3.92E-02 | 1           | 21                | LNU835       | 0.822 | 2.34E-02 | 1           | 20                |
| LNU835                                                                                                                                                                                                 | 0.753 | 8.37E-02 | 5           | 10                | LNU835       | 0.772 | 2.48E-02 | 2           | 10                |
| LNU835                                                                                                                                                                                                 | 0.881 | 8.80E-03 | 6           | 7                 | LNU835       | 0.811 | 2.69E-02 | 6           | 12                |
| LNU835                                                                                                                                                                                                 | 0.711 | 7.35E-02 | 6           | 11                | LNU835       | 0.724 | 6.57E-02 | 6           | 5                 |
| LNU835                                                                                                                                                                                                 | 0.809 | 2.76E-02 | 6           | 15                | LNU835       | 0.801 | 3.06E-02 | 6           | 14                |
| LNU835                                                                                                                                                                                                 | 0.759 | 4.77E-02 | 6           | 4                 | LNU835       | 0.821 | 2.36E-02 | 6           | 10                |
| LNU835                                                                                                                                                                                                 | 0.812 | 2.66E-02 | 6           | 16                | LNU835       | 0.814 | 2.59E-02 | 6           | 6                 |
| LNU835                                                                                                                                                                                                 | 0.801 | 3.06E-02 | 6           | 18                | LNU835       | 0.801 | 3.06E-02 | 6           | 21                |
| LNU835                                                                                                                                                                                                 | 0.833 | 2.00E-02 | 6           | 20                | LNU837       | 0.713 | 7.24E-02 | 1           | 11                |
| LNU837                                                                                                                                                                                                 | 0.879 | 9.15E-03 | 1           | 8                 | LNU837       | 0.737 | 9.44E-02 | 5           | 7                 |
| LNU837                                                                                                                                                                                                 | 0.845 | 3.41E-02 | 5           | 6                 | LNU837       | 0.731 | 2.54E-02 | 8           | 19                |
| LNU837                                                                                                                                                                                                 | 0.752 | 5.14E-02 | 4           | 2                 | LNU838       | 0.821 | 4.54E-02 | 5           | 17                |
| LNU838                                                                                                                                                                                                 | 0.715 | 1.10E-01 | 5           | 3                 | LNU838       | 0.821 | 4.54E-02 | 5           | 1                 |
| LNU838                                                                                                                                                                                                 | 0.784 | 2.14E-02 | 3           | 7                 | LNU838       | 0.717 | 4.53E-02 | 3           | 6                 |
| LNU839                                                                                                                                                                                                 | 0.853 | 3.08E-02 | 5           | 4                 | LNU839       | 0.712 | 1.13E-01 | 5           | 19                |
| LNU839                                                                                                                                                                                                 | 0.807 | 5.22E-02 | 5           | 2                 | LNU839       | 0.707 | 5.00E-02 | 2           | 8                 |
| LNU839                                                                                                                                                                                                 | 0.820 | 2.38E-02 | 6           | 6                 | LNU840       | 0.842 | 1.74E-02 | 1           | 7                 |
| LNU840                                                                                                                                                                                                 | 0.701 | 7.90E-02 | 1           | 6                 | LNU840       | 0.884 | 1.95E-02 | 5           | 17                |
| LNU840                                                                                                                                                                                                 | 0.884 | 1.95E-02 | 5           | 1                 | LNU841       | 0.754 | 5.01E-02 | 4           | 7                 |
| LNU841                                                                                                                                                                                                 | 0.761 | 4.68E-02 | 4           | 12                | LNU841       | 0.781 | 3.80E-02 | 4           | 15                |
| LNU841                                                                                                                                                                                                 | 0.729 | 6.29E-02 | 4           | 14                | LNU841       | 0.760 | 4.76E-02 | 4           | 16                |
| LNU841                                                                                                                                                                                                 | 0.894 | 6.56E-03 | 4           | 6                 | LNU841       | 0.729 | 6.29E-02 | 4           | 18                |
| LNU841                                                                                                                                                                                                 | 0.729 | 6.29E-02 | 4           | 21                | LNU841       | 0.769 | 4.32E-02 | 4           | 20                |
| LNU843                                                                                                                                                                                                 | 0.761 | 4.69E-02 | 1           | 4                 | LNU843       | 0.726 | 6.49E-02 | 1           | 9                 |
| LNU843                                                                                                                                                                                                 | 0.717 | 1.97E-02 | 8           | 5                 | LNU843       | 0.828 | 2.15E-02 | 4           | 7                 |
| LNU843                                                                                                                                                                                                 | 0.864 | 1.21E-02 | 4           | 12                | LNU843       | 0.800 | 3.08E-02 | 4           | 11                |
| LNU843                                                                                                                                                                                                 | 0.852 | 1.48E-02 | 4           | 15                | LNU843       | 0.840 | 1.79E-02 | 4           | 14                |
| LNU843                                                                                                                                                                                                 | 0.742 | 5.64E-02 | 4           | 4                 | LNU843       | 0.717 | 6.98E-02 | 4           | 10                |
| LNU843                                                                                                                                                                                                 | 0.859 | 1.34E-02 | 4           | 16                | LNU843       | 0.834 | 1.98E-02 | 4           | 6                 |
| LNU843                                                                                                                                                                                                 | 0.840 | 1.79E-02 | 4           | 18                | LNU843       | 0.840 | 1.79E-02 | 4           | 21                |
| LNU843                                                                                                                                                                                                 | 0.848 | 1.59E-02 | 4           | 20                | LNU844       | 0.894 | 1.63E-02 | 5           | 5                 |
| LNU845                                                                                                                                                                                                 | 0.761 | 7.91E-02 | 5           | 6                 | LNU845       | 0.800 | 1.71E-02 | 2           | 17                |
| LNU845                                                                                                                                                                                                 | 0.800 | 1.71E-02 | 2           | 1                 | LNU845       | 0.825 | 1.17E-02 | 2           | 9                 |
| LNU845                                                                                                                                                                                                 | 0.710 | 2.14E-02 | 8           | 11                | LNU845       | 0.874 | 1.01E-02 | 4           | 8                 |
| LNU846                                                                                                                                                                                                 | 0.809 | 5.14E-02 | 5           | 10                | LNU846       | 0.787 | 2.06E-02 | 2           | 12                |

TABLE 60-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under normal conditions across maize varieties |       |          |          |             |           |       |          |          |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                        | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU846                                                                                                                                                                                           | 0.865 | 5.50E-03 | 2        | 4           | LNU846    | 0.707 | 4.99E-02 | 2        | 19          |
| LNU846                                                                                                                                                                                           | 0.735 | 1.55E-02 | 8        | 11          | LNU846    | 0.706 | 2.26E-02 | 8        | 8           |
| LNU846                                                                                                                                                                                           | 0.746 | 5.39E-02 | 4        | 12          | LNU846    | 0.819 | 2.41E-02 | 4        | 11          |
| LNU846                                                                                                                                                                                           | 0.737 | 5.88E-02 | 4        | 15          | LNU846    | 0.771 | 4.23E-02 | 4        | 14          |
| LNU846                                                                                                                                                                                           | 0.796 | 3.24E-02 | 4        | 4           | LNU846    | 0.703 | 7.81E-02 | 4        | 16          |
| LNU846                                                                                                                                                                                           | 0.771 | 4.23E-02 | 4        | 18          | LNU846    | 0.899 | 5.94E-03 | 4        | 8           |
| LNU846                                                                                                                                                                                           | 0.771 | 4.23E-02 | 4        | 21          | LNU846    | 0.726 | 6.45E-02 | 4        | 9           |
| LNU846                                                                                                                                                                                           | 0.755 | 8.24E-02 | 4        | 19          | LNU846    | 0.724 | 6.56E-02 | 4        | 20          |
| LNU846                                                                                                                                                                                           | 0.809 | 8.33E-03 | 7        | 3           | LNU846    | 0.849 | 7.69E-03 | 7        | 19          |
| LNU846                                                                                                                                                                                           | 0.746 | 2.09E-02 | 7        | 2           |           |       |          |          |             |

Table 60. Provided are the correlations (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector (Cor))] under normal conditions across maize varieties.  
P = p value.

TABLE 61

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under low N conditions across maize varieties |       |          |          |              |           |       |          |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|--------------|-----------|-------|----------|----------|--------------|
| Gene Name                                                                                                                                                                                       | R     | P value  | Exp. set | Corr. Set ID | Gene Name | R     | P value  | Exp. set | Corr. Set ID |
| LNU811                                                                                                                                                                                          | 0.836 | 3.80E-02 | 1        | 13           | LNU811    | 0.782 | 2.18E-02 | 5        | 19           |
| LNU813                                                                                                                                                                                          | 0.876 | 2.22E-02 | 1        | 13           | LNU813    | 0.762 | 4.66E-02 | 1        | 11           |
| LNU813                                                                                                                                                                                          | 0.835 | 1.93E-02 | 1        | 2            | LNU813    | 0.731 | 6.18E-02 | 1        | 1            |
| LNU813                                                                                                                                                                                          | 0.766 | 1.61E-02 | 5        | 7            | LNU813    | 0.705 | 5.09E-02 | 5        | 19           |
| LNU813                                                                                                                                                                                          | 0.730 | 9.98E-02 | 6        | 10           | LNU813    | 0.842 | 3.53E-02 | 6        | 9            |
| LNU813                                                                                                                                                                                          | 0.879 | 2.10E-02 | 6        | 5            | LNU813    | 0.941 | 5.07E-03 | 6        | 6            |
| LNU813                                                                                                                                                                                          | 0.708 | 1.16E-01 | 6        | 15           | LNU813    | 0.708 | 1.15E-01 | 6        | 19           |
| LNU813                                                                                                                                                                                          | 0.733 | 9.77E-02 | 6        | 1            | LNU813    | 0.727 | 1.73E-02 | 3        | 10           |
| LNU813                                                                                                                                                                                          | 0.766 | 9.82E-03 | 3        | 9            | LNU813    | 0.843 | 1.72E-02 | 8        | 13           |
| LNU813                                                                                                                                                                                          | 0.726 | 6.48E-02 | 7        | 13           | LNU813    | 0.702 | 5.21E-02 | 7        | 8            |
| LNU813                                                                                                                                                                                          | 0.746 | 5.42E-02 | 4        | 6            | LNU814    | 0.832 | 3.97E-02 | 1        | 19           |
| LNU814                                                                                                                                                                                          | 0.923 | 3.02E-03 | 1        | 2            | LNU814    | 0.752 | 5.12E-02 | 1        | 1            |
| LNU814                                                                                                                                                                                          | 0.713 | 7.21E-02 | 1        | 16           | LNU814    | 0.873 | 4.67E-03 | 5        | 13           |
| LNU814                                                                                                                                                                                          | 0.786 | 2.07E-02 | 5        | 19           | LNU814    | 0.777 | 6.88E-02 | 6        | 18           |
| LNU814                                                                                                                                                                                          | 0.850 | 3.20E-02 | 6        | 4            | LNU814    | 0.776 | 6.94E-02 | 6        | 8            |
| LNU814                                                                                                                                                                                          | 0.777 | 6.88E-02 | 6        | 14           | LNU814    | 0.703 | 1.20E-01 | 6        | 20           |
| LNU814                                                                                                                                                                                          | 0.897 | 1.54E-02 | 6        | 6            | LNU814    | 0.881 | 2.04E-02 | 6        | 15           |
| LNU814                                                                                                                                                                                          | 0.808 | 5.18E-02 | 6        | 19           | LNU814    | 0.777 | 6.88E-02 | 6        | 2            |
| LNU814                                                                                                                                                                                          | 0.777 | 6.88E-02 | 6        | 21           | LNU814    | 0.833 | 3.95E-02 | 6        | 16           |
| LNU814                                                                                                                                                                                          | 0.785 | 3.64E-02 | 8        | 13           | LNU814    | 0.752 | 3.14E-02 | 8        | 10           |
| LNU814                                                                                                                                                                                          | 0.727 | 4.08E-02 | 8        | 4            | LNU814    | 0.873 | 1.03E-02 | 7        | 13           |
| LNU814                                                                                                                                                                                          | 0.799 | 1.73E-02 | 7        | 11           | LNU814    | 0.826 | 2.21E-02 | 7        | 19           |
| LNU814                                                                                                                                                                                          | 0.766 | 2.67E-02 | 7        | 2            | LNU814    | 0.774 | 2.43E-02 | 2        | 10           |
| LNU814                                                                                                                                                                                          | 0.802 | 3.02E-02 | 4        | 5            | LNU814    | 0.729 | 6.28E-02 | 4        | 11           |
| LNU814                                                                                                                                                                                          | 0.742 | 5.61E-02 | 4        | 15           | LNU814    | 0.839 | 1.83E-02 | 4        | 19           |
| LNU814                                                                                                                                                                                          | 0.703 | 7.78E-02 | 4        | 2            | LNU814    | 0.709 | 7.47E-02 | 4        | 16           |
| LNU815                                                                                                                                                                                          | 0.775 | 7.03E-02 | 6        | 13           | LNU815    | 0.903 | 1.37E-02 | 6        | 11           |
| LNU816                                                                                                                                                                                          | 0.830 | 2.08E-02 | 1        | 1            | LNU816    | 0.934 | 6.40E-03 | 6        | 3            |
| LNU816                                                                                                                                                                                          | 0.815 | 4.09E-03 | 3        | 9            | LNU816    | 0.911 | 4.27E-03 | 8        | 13           |
| LNU816                                                                                                                                                                                          | 0.753 | 3.10E-02 | 8        | 7            | LNU816    | 0.883 | 8.36E-03 | 7        | 13           |
| LNU816                                                                                                                                                                                          | 0.910 | 1.71E-03 | 7        | 11           | LNU817    | 0.748 | 2.04E-02 | 5        | 6            |
| LNU817                                                                                                                                                                                          | 0.737 | 9.47E-02 | 6        | 5            | LNU817    | 0.708 | 4.94E-02 | 2        | 10           |
| LNU817                                                                                                                                                                                          | 0.792 | 1.92E-02 | 2        | 4            | LNU817    | 0.916 | 1.41E-03 | 2        | 5            |
| LNU817                                                                                                                                                                                          | 0.893 | 2.82E-03 | 2        | 6            | LNU817    | 0.775 | 4.09E-02 | 4        | 6            |
| LNU818                                                                                                                                                                                          | 0.878 | 9.37E-03 | 1        | 8            | LNU818    | 0.844 | 8.44E-03 | 5        | 13           |
| LNU818                                                                                                                                                                                          | 0.705 | 3.40E-02 | 5        | 11           | LNU818    | 0.910 | 1.19E-02 | 6        | 18           |
| LNU818                                                                                                                                                                                          | 0.760 | 7.98E-02 | 6        | 4            | LNU818    | 0.709 | 1.15E-01 | 6        | 8            |
| LNU818                                                                                                                                                                                          | 0.910 | 1.19E-02 | 6        | 14           | LNU818    | 0.716 | 1.10E-01 | 6        | 20           |
| LNU818                                                                                                                                                                                          | 0.771 | 7.29E-02 | 6        | 15           | LNU818    | 0.796 | 5.84E-02 | 6        | 19           |
| LNU818                                                                                                                                                                                          | 0.742 | 9.11E-02 | 6        | 2            | LNU818    | 0.910 | 1.19E-02 | 6        | 21           |
| LNU818                                                                                                                                                                                          | 0.814 | 4.89E-02 | 6        | 16           | LNU818    | 0.806 | 8.77E-03 | 3        | 13           |
| LNU818                                                                                                                                                                                          | 0.705 | 5.08E-02 | 8        | 8            | LNU818    | 0.828 | 1.12E-02 | 7        | 8            |
| LNU818                                                                                                                                                                                          | 0.882 | 8.69E-03 | 2        | 13           | LNU818    | 0.882 | 3.71E-03 | 2        | 11           |
| LNU818                                                                                                                                                                                          | 0.776 | 4.04E-02 | 4        | 9            | LNU818    | 0.860 | 1.31E-02 | 4        | 8            |
| LNU819                                                                                                                                                                                          | 0.712 | 1.12E-01 | 6        | 18           | LNU819    | 0.712 | 1.12E-01 | 6        | 14           |

TABLE 61-continued

| Correlation between the expression level of selected genes of some<br>embodiments of the invention in various tissues and the phenotypic<br>performance under low N conditions across maize varieties |       |          |             |                    |              |       |          |             |                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|-------------|--------------------|--------------|-------|----------|-------------|--------------------|
| Gene<br>Name                                                                                                                                                                                          | R     | P value  | Exp.<br>set | Corr.<br>Set<br>ID | Gene<br>Name | R     | P value  | Exp.<br>set | Corr.<br>Set<br>ID |
| LNU819                                                                                                                                                                                                | 0.703 | 1.19E-01 | 6           | 15                 | LNU819       | 0.889 | 1.78E-02 | 6           | 19                 |
| LNU819                                                                                                                                                                                                | 0.946 | 4.29E-03 | 6           | 1                  | LNU819       | 0.712 | 1.12E-01 | 6           | 21                 |
| LNU819                                                                                                                                                                                                | 0.742 | 5.63E-02 | 4           | 17                 | LNU819       | 0.729 | 6.32E-02 | 4           | 8                  |
| LNU819                                                                                                                                                                                                | 0.859 | 1.32E-02 | 4           | 7                  | LNU819       | 0.742 | 5.63E-02 | 4           | 12                 |
| LNU820                                                                                                                                                                                                | 0.854 | 3.06E-02 | 6           | 10                 | LNU820       | 0.748 | 8.71E-02 | 6           | 3                  |
| LNU820                                                                                                                                                                                                | 0.771 | 7.27E-02 | 6           | 5                  | LNU820       | 0.738 | 3.67E-02 | 8           | 17                 |
| LNU820                                                                                                                                                                                                | 0.738 | 3.67E-02 | 8           | 12                 | LNU820       | 0.783 | 2.16E-02 | 2           | 18                 |
| LNU820                                                                                                                                                                                                | 0.783 | 2.16E-02 | 2           | 14                 | LNU820       | 0.826 | 1.15E-02 | 2           | 20                 |
| LNU820                                                                                                                                                                                                | 0.778 | 2.29E-02 | 2           | 15                 | LNU820       | 0.783 | 2.16E-02 | 2           | 21                 |
| LNU820                                                                                                                                                                                                | 0.798 | 1.76E-02 | 2           | 16                 | LNU821       | 0.705 | 1.18E-01 | 1           | 19                 |
| LNU821                                                                                                                                                                                                | 0.701 | 7.95E-02 | 1           | 2                  | LNU821       | 0.835 | 3.85E-02 | 6           | 8                  |
| LNU821                                                                                                                                                                                                | 0.846 | 8.04E-03 | 2           | 18                 | LNU821       | 0.846 | 8.04E-03 | 2           | 14                 |
| LNU821                                                                                                                                                                                                | 0.874 | 4.59E-03 | 2           | 20                 | LNU821       | 0.818 | 1.31E-02 | 2           | 15                 |
| LNU821                                                                                                                                                                                                | 0.888 | 7.64E-03 | 2           | 19                 | LNU821       | 0.922 | 1.13E-03 | 2           | 2                  |
| LNU821                                                                                                                                                                                                | 0.763 | 2.75E-02 | 2           | 1                  | LNU821       | 0.846 | 8.04E-03 | 2           | 21                 |
| LNU821                                                                                                                                                                                                | 0.867 | 5.26E-03 | 2           | 16                 | LNU821       | 0.953 | 8.86E-04 | 4           | 17                 |
| LNU821                                                                                                                                                                                                | 0.953 | 8.86E-04 | 4           | 12                 | LNU822       | 0.727 | 6.41E-02 | 8           | 19                 |
| LNU822                                                                                                                                                                                                | 0.795 | 3.24E-02 | 4           | 17                 | LNU822       | 0.795 | 3.24E-02 | 4           | 12                 |
| LNU823                                                                                                                                                                                                | 0.832 | 2.02E-02 | 1           | 17                 | LNU823       | 0.712 | 7.28E-02 | 1           | 9                  |
| LNU823                                                                                                                                                                                                | 0.712 | 7.29E-02 | 1           | 3                  | LNU823       | 0.710 | 7.38E-02 | 1           | 5                  |
| LNU823                                                                                                                                                                                                | 0.926 | 2.77E-03 | 1           | 7                  | LNU823       | 0.832 | 2.02E-02 | 1           | 12                 |
| LNU823                                                                                                                                                                                                | 0.710 | 3.23E-02 | 5           | 10                 | LNU823       | 0.770 | 9.19E-03 | 3           | 3                  |
| LNU823                                                                                                                                                                                                | 0.735 | 3.79E-02 | 2           | 3                  | LNU823       | 0.842 | 8.65E-03 | 2           | 7                  |
| LNU823                                                                                                                                                                                                | 0.713 | 7.21E-02 | 4           | 4                  | LNU823       | 0.704 | 7.75E-02 | 4           | 7                  |
| LNU824                                                                                                                                                                                                | 0.769 | 4.32E-02 | 1           | 18                 | LNU824       | 0.757 | 4.88E-02 | 1           | 4                  |
| LNU824                                                                                                                                                                                                | 0.769 | 4.32E-02 | 1           | 14                 | LNU824       | 0.740 | 5.71E-02 | 1           | 15                 |
| LNU824                                                                                                                                                                                                | 0.800 | 5.60E-02 | 1           | 19                 | LNU824       | 0.774 | 4.10E-02 | 1           | 2                  |
| LNU824                                                                                                                                                                                                | 0.784 | 3.71E-02 | 1           | 1                  | LNU824       | 0.769 | 4.32E-02 | 1           | 21                 |
| LNU824                                                                                                                                                                                                | 0.746 | 5.40E-02 | 1           | 16                 | LNU824       | 0.791 | 1.12E-02 | 5           | 9                  |
| LNU824                                                                                                                                                                                                | 0.714 | 3.07E-02 | 5           | 4                  | LNU824       | 0.758 | 4.85E-02 | 8           | 19                 |
| LNU824                                                                                                                                                                                                | 0.703 | 5.17E-02 | 2           | 17                 | LNU824       | 0.835 | 9.93E-03 | 2           | 4                  |
| LNU824                                                                                                                                                                                                | 0.877 | 4.25E-03 | 2           | 5                  | LNU824       | 0.889 | 3.12E-03 | 2           | 6                  |
| LNU824                                                                                                                                                                                                | 0.703 | 5.17E-02 | 2           | 12                 | LNU824       | 0.786 | 3.60E-02 | 4           | 13                 |
| LNU824                                                                                                                                                                                                | 0.846 | 1.65E-02 | 4           | 11                 | LNU825       | 0.800 | 3.06E-02 | 1           | 8                  |
| LNU825                                                                                                                                                                                                | 0.916 | 3.70E-03 | 8           | 13                 | LNU825       | 0.885 | 3.45E-03 | 8           | 11                 |
| LNU825                                                                                                                                                                                                | 0.729 | 4.03E-02 | 7           | 8                  | LNU825       | 0.908 | 4.75E-03 | 2           | 13                 |
| LNU825                                                                                                                                                                                                | 0.804 | 1.62E-02 | 2           | 11                 | LNU825       | 0.740 | 5.74E-02 | 4           | 17                 |
| LNU825                                                                                                                                                                                                | 0.740 | 5.74E-02 | 4           | 12                 | LNU828       | 0.990 | 1.44E-04 | 6           | 5                  |
| LNU828                                                                                                                                                                                                | 0.823 | 4.40E-02 | 6           | 6                  | LNU828       | 0.721 | 1.06E-01 | 6           | 15                 |
| LNU829                                                                                                                                                                                                | 0.805 | 2.91E-02 | 4           | 8                  | LNU830       | 0.762 | 2.78E-02 | 5           | 19                 |
| LNU830                                                                                                                                                                                                | 0.748 | 8.74E-02 | 6           | 7                  | LNU831       | 0.939 | 5.45E-03 | 1           | 13                 |
| LNU831                                                                                                                                                                                                | 0.715 | 7.09E-02 | 1           | 11                 | LNU831       | 0.904 | 2.03E-03 | 5           | 13                 |
| LNU831                                                                                                                                                                                                | 0.757 | 1.81E-02 | 5           | 11                 | LNU831       | 0.702 | 7.90E-02 | 8           | 13                 |
| LNU831                                                                                                                                                                                                | 0.894 | 6.66E-03 | 2           | 13                 | LNU831       | 0.921 | 3.25E-03 | 4           | 13                 |
| LNU831                                                                                                                                                                                                | 0.978 | 1.40E-04 | 4           | 11                 | LNU832       | 0.825 | 2.23E-02 | 1           | 5                  |
| LNU832                                                                                                                                                                                                | 0.768 | 4.36E-02 | 1           | 20                 | LNU832       | 0.866 | 1.18E-02 | 1           | 6                  |
| LNU832                                                                                                                                                                                                | 0.719 | 6.85E-02 | 1           | 15                 | LNU832       | 0.801 | 3.05E-02 | 1           | 1                  |
| LNU832                                                                                                                                                                                                | 0.706 | 7.60E-02 | 1           | 16                 | LNU832       | 0.895 | 1.61E-02 | 6           | 5                  |
| LNU832                                                                                                                                                                                                | 0.875 | 2.24E-02 | 6           | 6                  | LNU832       | 0.856 | 3.21E-03 | 3           | 13                 |
| LNU832                                                                                                                                                                                                | 0.767 | 9.66E-03 | 3           | 9                  | LNU832       | 0.827 | 3.13E-03 | 3           | 11                 |
| LNU832                                                                                                                                                                                                | 0.707 | 4.96E-02 | 8           | 5                  | LNU832       | 0.746 | 3.36E-02 | 8           | 11                 |
| LNU832                                                                                                                                                                                                | 0.713 | 4.73E-02 | 8           | 6                  | LNU832       | 0.797 | 1.79E-02 | 7           | 18                 |
| LNU832                                                                                                                                                                                                | 0.827 | 1.13E-02 | 7           | 4                  | LNU832       | 0.725 | 4.20E-02 | 7           | 3                  |
| LNU832                                                                                                                                                                                                | 0.893 | 2.85E-03 | 7           | 5                  | LNU832       | 0.797 | 1.79E-02 | 7           | 14                 |
| LNU832                                                                                                                                                                                                | 0.829 | 1.09E-02 | 7           | 20                 | LNU832       | 0.944 | 4.10E-04 | 7           | 6                  |
| LNU832                                                                                                                                                                                                | 0.839 | 9.28E-03 | 7           | 15                 | LNU832       | 0.797 | 1.79E-02 | 7           | 21                 |
| LNU832                                                                                                                                                                                                | 0.817 | 1.33E-02 | 7           | 16                 | LNU832       | 0.809 | 1.51E-02 | 2           | 9                  |
| LNU832                                                                                                                                                                                                | 0.734 | 3.80E-02 | 2           | 4                  | LNU832       | 0.717 | 4.54E-02 | 2           | 11                 |
| LNU832                                                                                                                                                                                                | 0.751 | 3.17E-02 | 2           | 6                  | LNU833       | 0.778 | 3.96E-02 | 1           | 10                 |
| LNU833                                                                                                                                                                                                | 0.813 | 2.61E-02 | 1           | 5                  | LNU833       | 0.765 | 4.51E-02 | 1           | 11                 |
| LNU833                                                                                                                                                                                                | 0.746 | 5.44E-02 | 1           | 6                  | LNU833       | 0.873 | 1.02E-02 | 1           | 1                  |
| LNU833                                                                                                                                                                                                | 0.776 | 6.99E-02 | 6           | 8                  | LNU833       | 0.738 | 9.37E-02 | 6           | 11                 |
| LNU833                                                                                                                                                                                                | 0.853 | 1.46E-02 | 7           | 13                 | LNU833       | 0.904 | 2.03E-03 | 7           | 11                 |
| LNU833                                                                                                                                                                                                | 0.715 | 4.62E-02 | 2           | 20                 | LNU833       | 0.738 | 3.66E-02 | 2           | 11                 |
| LNU833                                                                                                                                                                                                | 0.715 | 4.63E-02 | 2           | 16                 | LNU833       | 0.745 | 5.46E-02 | 4           | 9                  |
| LNU833                                                                                                                                                                                                | 0.836 | 1.92E-02 | 4           | 8                  | LNU834       | 0.820 | 2.41E-02 | 1           | 18                 |
| LNU834                                                                                                                                                                                                | 0.737 | 5.87E-02 | 1           | 10                 | LNU834       | 0.871 | 1.07E-02 | 1           | 17                 |
| LNU834                                                                                                                                                                                                | 0.810 | 2.71E-02 | 1           | 9                  | LNU834       | 0.722 | 6.72E-02 | 1           | 4                  |
| LNU834                                                                                                                                                                                                | 0.819 | 2.43E-02 | 1           | 3                  | LNU834       | 0.805 | 2.90E-02 | 1           | 5                  |
| LNU834                                                                                                                                                                                                | 0.894 | 6.67E-03 | 1           | 7                  | LNU834       | 0.820 | 2.41E-02 | 1           | 14                 |
| LNU834                                                                                                                                                                                                | 0.750 | 5.23E-02 | 1           | 20                 | LNU834       | 0.803 | 2.96E-02 | 1           | 6                  |
| LNU834                                                                                                                                                                                                | 0.869 | 1.10E-02 | 1           | 15                 | LNU834       | 0.871 | 1.07E-02 | 1           | 12                 |

TABLE 61-continued

| Correlation between the expression level of selected genes of some<br>embodiments of the invention in various tissues and the phenotypic<br>performance under low N conditions across maize varieties |       |          |             |                    |              |       |          |             |                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|-------------|--------------------|--------------|-------|----------|-------------|--------------------|
| Gene<br>Name                                                                                                                                                                                          | R     | P value  | Exp.<br>set | Corr.<br>Set<br>ID | Gene<br>Name | R     | P value  | Exp.<br>set | Corr.<br>Set<br>ID |
| LNU834                                                                                                                                                                                                | 0.886 | 1.88E-02 | 1           | 19                 | LNU834       | 0.805 | 2.88E-02 | 1           | 2                  |
| LNU834                                                                                                                                                                                                | 0.724 | 6.61E-02 | 1           | 1                  | LNU834       | 0.820 | 2.41E-02 | 1           | 21                 |
| LNU834                                                                                                                                                                                                | 0.852 | 1.49E-02 | 1           | 16                 | LNU834       | 0.927 | 7.87E-03 | 6           | 18                 |
| LNU834                                                                                                                                                                                                | 0.846 | 3.38E-02 | 6           | 4                  | LNU834       | 0.927 | 7.87E-03 | 6           | 14                 |
| LNU834                                                                                                                                                                                                | 0.831 | 4.03E-02 | 6           | 15                 | LNU834       | 0.879 | 2.12E-02 | 6           | 19                 |
| LNU834                                                                                                                                                                                                | 0.758 | 8.05E-02 | 6           | 2                  | LNU834       | 0.927 | 7.87E-03 | 6           | 21                 |
| LNU834                                                                                                                                                                                                | 0.839 | 3.69E-02 | 6           | 16                 | LNU834       | 0.723 | 2.78E-02 | 3           | 13                 |
| LNU834                                                                                                                                                                                                | 0.743 | 1.37E-02 | 3           | 17                 | LNU834       | 0.786 | 7.05E-03 | 3           | 9                  |
| LNU834                                                                                                                                                                                                | 0.711 | 2.12E-02 | 3           | 3                  | LNU834       | 0.795 | 6.03E-03 | 3           | 11                 |
| LNU834                                                                                                                                                                                                | 0.743 | 1.37E-02 | 3           | 12                 | LNU834       | 0.700 | 5.31E-02 | 8           | 10                 |
| LNU834                                                                                                                                                                                                | 0.927 | 9.31E-04 | 8           | 4                  | LNU834       | 0.758 | 2.93E-02 | 8           | 5                  |
| LNU834                                                                                                                                                                                                | 0.855 | 6.81E-03 | 8           | 6                  | LNU834       | 0.775 | 2.38E-02 | 7           | 7                  |
| LNU834                                                                                                                                                                                                | 0.760 | 2.87E-02 | 7           | 11                 | LNU834       | 0.933 | 2.14E-03 | 2           | 13                 |
| LNU834                                                                                                                                                                                                | 0.748 | 3.29E-02 | 2           | 17                 | LNU834       | 0.765 | 2.69E-02 | 2           | 9                  |
| LNU834                                                                                                                                                                                                | 0.883 | 3.63E-03 | 2           | 4                  | LNU834       | 0.851 | 7.38E-03 | 2           | 5                  |
| LNU834                                                                                                                                                                                                | 0.850 | 7.48E-03 | 2           | 6                  | LNU834       | 0.748 | 3.29E-02 | 2           | 12                 |
| LNU834                                                                                                                                                                                                | 0.822 | 2.31E-02 | 4           | 13                 | LNU834       | 0.990 | 1.73E-05 | 4           | 11                 |
| LNU835                                                                                                                                                                                                | 0.867 | 1.16E-02 | 1           | 8                  | LNU835       | 0.710 | 7.37E-02 | 1           | 20                 |
| LNU835                                                                                                                                                                                                | 0.822 | 4.45E-02 | 6           | 11                 | LNU835       | 0.754 | 1.89E-02 | 3           | 13                 |
| LNU835                                                                                                                                                                                                | 0.892 | 6.97E-03 | 8           | 13                 | LNU835       | 0.973 | 4.88E-05 | 8           | 11                 |
| LNU835                                                                                                                                                                                                | 0.739 | 3.61E-02 | 7           | 5                  | LNU835       | 0.711 | 4.81E-02 | 7           | 20                 |
| LNU835                                                                                                                                                                                                | 0.788 | 2.01E-02 | 2           | 4                  | LNU835       | 0.780 | 2.25E-02 | 2           | 6                  |
| LNU835                                                                                                                                                                                                | 0.881 | 8.78E-03 | 4           | 13                 | LNU837       | 0.897 | 1.54E-02 | 1           | 19                 |
| LNU837                                                                                                                                                                                                | 0.776 | 4.02E-02 | 1           | 2                  | LNU837       | 0.825 | 2.24E-02 | 1           | 1                  |
| LNU838                                                                                                                                                                                                | 0.941 | 1.55E-03 | 4           | 13                 | LNU838       | 0.953 | 9.08E-04 | 4           | 11                 |
| LNU839                                                                                                                                                                                                | 0.820 | 2.41E-02 | 1           | 18                 | LNU839       | 0.739 | 5.77E-02 | 1           | 17                 |
| LNU839                                                                                                                                                                                                | 0.722 | 6.72E-02 | 1           | 4                  | LNU839       | 0.740 | 5.73E-02 | 1           | 3                  |
| LNU839                                                                                                                                                                                                | 0.805 | 2.90E-02 | 1           | 5                  | LNU839       | 0.820 | 2.41E-02 | 1           | 14                 |
| LNU839                                                                                                                                                                                                | 0.750 | 5.23E-02 | 1           | 20                 | LNU839       | 0.803 | 2.96E-02 | 1           | 6                  |
| LNU839                                                                                                                                                                                                | 0.869 | 1.10E-02 | 1           | 15                 | LNU839       | 0.739 | 5.77E-02 | 1           | 12                 |
| LNU839                                                                                                                                                                                                | 0.886 | 1.88E-02 | 1           | 19                 | LNU839       | 0.805 | 2.88E-02 | 1           | 2                  |
| LNU839                                                                                                                                                                                                | 0.724 | 6.61E-02 | 1           | 1                  | LNU839       | 0.820 | 2.41E-02 | 1           | 21                 |
| LNU839                                                                                                                                                                                                | 0.852 | 1.49E-02 | 1           | 16                 | LNU839       | 0.927 | 7.87E-03 | 6           | 18                 |
| LNU839                                                                                                                                                                                                | 0.846 | 3.38E-02 | 6           | 4                  | LNU839       | 0.731 | 9.85E-02 | 6           | 8                  |
| LNU839                                                                                                                                                                                                | 0.927 | 7.87E-03 | 6           | 14                 | LNU839       | 0.831 | 4.03E-02 | 6           | 15                 |
| LNU839                                                                                                                                                                                                | 0.879 | 2.12E-02 | 6           | 19                 | LNU839       | 0.758 | 8.05E-02 | 6           | 2                  |
| LNU839                                                                                                                                                                                                | 0.927 | 7.87E-03 | 6           | 21                 | LNU839       | 0.839 | 3.69E-02 | 6           | 16                 |
| LNU839                                                                                                                                                                                                | 0.723 | 2.78E-02 | 3           | 13                 | LNU839       | 0.795 | 6.03E-03 | 3           | 11                 |
| LNU839                                                                                                                                                                                                | 0.760 | 2.87E-02 | 7           | 11                 | LNU839       | 0.883 | 3.63E-03 | 2           | 4                  |
| LNU839                                                                                                                                                                                                | 0.851 | 7.38E-03 | 2           | 5                  | LNU839       | 0.850 | 7.48E-03 | 2           | 6                  |
| LNU839                                                                                                                                                                                                | 0.822 | 2.31E-02 | 4           | 13                 | LNU839       | 0.752 | 5.11E-02 | 4           | 9                  |
| LNU839                                                                                                                                                                                                | 0.930 | 2.40E-03 | 4           | 8                  | LNU839       | 0.990 | 1.73E-05 | 4           | 11                 |
| LNU840                                                                                                                                                                                                | 0.701 | 5.28E-02 | 7           | 9                  | LNU841       | 0.843 | 3.50E-02 | 6           | 13                 |
| LNU841                                                                                                                                                                                                | 0.737 | 3.69E-02 | 8           | 8                  | LNU841       | 0.929 | 2.48E-03 | 7           | 13                 |
| LNU841                                                                                                                                                                                                | 0.808 | 1.54E-02 | 7           | 11                 | LNU843       | 0.701 | 7.94E-02 | 1           | 18                 |
| LNU843                                                                                                                                                                                                | 0.871 | 1.07E-02 | 1           | 10                 | LNU843       | 0.890 | 7.22E-03 | 1           | 17                 |
| LNU843                                                                                                                                                                                                | 0.787 | 3.58E-02 | 1           | 9                  | LNU843       | 0.803 | 2.97E-02 | 1           | 3                  |
| LNU843                                                                                                                                                                                                | 0.821 | 2.36E-02 | 1           | 7                  | LNU843       | 0.701 | 7.94E-02 | 1           | 14                 |
| LNU843                                                                                                                                                                                                | 0.890 | 7.22E-03 | 1           | 12                 | LNU843       | 0.701 | 7.94E-02 | 1           | 21                 |
| LNU843                                                                                                                                                                                                | 0.722 | 1.84E-02 | 3           | 10                 | LNU844       | 0.745 | 8.95E-02 | 6           | 10                 |
| LNU844                                                                                                                                                                                                | 0.865 | 5.60E-03 | 8           | 7                  | LNU844       | 0.765 | 2.69E-02 | 7           | 17                 |
| LNU844                                                                                                                                                                                                | 0.814 | 1.38E-02 | 7           | 7                  | LNU844       | 0.765 | 2.69E-02 | 7           | 12                 |
| LNU845                                                                                                                                                                                                | 0.823 | 2.28E-02 | 1           | 18                 | LNU845       | 0.706 | 7.65E-02 | 1           | 17                 |
| LNU845                                                                                                                                                                                                | 0.786 | 3.60E-02 | 1           | 9                  | LNU845       | 0.746 | 5.42E-02 | 1           | 3                  |
| LNU845                                                                                                                                                                                                | 0.903 | 5.33E-03 | 1           | 5                  | LNU845       | 0.823 | 2.28E-02 | 1           | 14                 |
| LNU845                                                                                                                                                                                                | 0.847 | 1.61E-02 | 1           | 20                 | LNU845       | 0.840 | 1.81E-02 | 1           | 6                  |
| LNU845                                                                                                                                                                                                | 0.871 | 1.06E-02 | 1           | 15                 | LNU845       | 0.706 | 7.65E-02 | 1           | 12                 |
| LNU845                                                                                                                                                                                                | 0.818 | 4.68E-02 | 1           | 19                 | LNU845       | 0.879 | 9.12E-03 | 1           | 2                  |
| LNU845                                                                                                                                                                                                | 0.909 | 4.59E-03 | 1           | 1                  | LNU845       | 0.823 | 2.28E-02 | 1           | 21                 |
| LNU845                                                                                                                                                                                                | 0.873 | 1.04E-02 | 1           | 16                 | LNU845       | 0.818 | 4.64E-02 | 6           | 9                  |
| LNU845                                                                                                                                                                                                | 0.894 | 1.62E-02 | 6           | 7                  | LNU845       | 0.705 | 2.28E-02 | 3           | 7                  |
| LNU845                                                                                                                                                                                                | 0.710 | 3.20E-02 | 3           | 19                 | LNU845       | 0.785 | 7.12E-03 | 3           | 1                  |
| LNU845                                                                                                                                                                                                | 0.784 | 2.12E-02 | 8           | 17                 | LNU845       | 0.839 | 9.14E-03 | 8           | 9                  |
| LNU845                                                                                                                                                                                                | 0.816 | 1.35E-02 | 8           | 8                  | LNU845       | 0.740 | 3.58E-02 | 8           | 7                  |
| LNU845                                                                                                                                                                                                | 0.717 | 4.54E-02 | 8           | 20                 | LNU845       | 0.784 | 2.12E-02 | 8           | 12                 |
| LNU845                                                                                                                                                                                                | 0.763 | 2.75E-02 | 7           | 9                  | LNU845       | 0.762 | 2.79E-02 | 7           | 8                  |
| LNU845                                                                                                                                                                                                | 0.797 | 3.17E-02 | 4           | 5                  | LNU845       | 0.703 | 7.81E-02 | 4           | 6                  |
| LNU846                                                                                                                                                                                                | 0.711 | 1.13E-01 | 6           | 10                 | LNU846       | 0.791 | 6.08E-02 | 6           | 3                  |
| LNU846                                                                                                                                                                                                | 0.843 | 8.57E-03 | 8           | 17                 | LNU846       | 0.881 | 3.86E-03 | 8           | 5                  |
| LNU846                                                                                                                                                                                                | 0.788 | 2.03E-02 | 8           | 6                  | LNU846       | 0.843 | 8.57E-03 | 8           | 12                 |
| LNU846                                                                                                                                                                                                | 0.779 | 2.26E-02 | 7           | 10                 | LNU846       | 0.701 | 5.25E-02 | 2           | 18                 |
| LNU846                                                                                                                                                                                                | 0.820 | 1.26E-02 | 2           | 10                 | LNU846       | 0.845 | 8.19E-03 | 2           | 9                  |

TABLE 61-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under low N conditions across maize varieties |       |          |          |              |           |       |          |          |              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|--------------|-----------|-------|----------|----------|--------------|
| Gene Name                                                                                                                                                                                       | R     | P value  | Exp. set | Corr. Set ID | Gene Name | R     | P value  | Exp. set | Corr. Set ID |
| LNU846                                                                                                                                                                                          | 0.832 | 1.05E-02 | 2        | 3            | LNU846    | 0.701 | 5.25E-02 | 2        | 14           |
| LNU846                                                                                                                                                                                          | 0.724 | 4.25E-02 | 2        | 6            | LNU846    | 0.711 | 4.82E-02 | 2        | 15           |
| LNU846                                                                                                                                                                                          | 0.701 | 5.25E-02 | 2        | 21           |           |       |          |          |              |

Table 61. Provided are the correlations (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector (Cor))] under low Nitrogen conditions across maize varieties. P = p value.

## Example 9

### Production of Tomato Transcriptom and High Throughput Correlation Analysis Using 44K Tomato Oligonucleotide Micro-Array

In order to produce a high throughput correlation analysis between NUE related phenotypes and gene expression, the present inventors utilized a Tomato oligonucleotide micro-array, produced by Agilent Technologies [chem. (dot) agilent (dot) com/Scripts/PDS (dot) asp?1Page=50879]. The array oligonucleotide represents about 44,000 Tomato genes and transcripts. In order to define correlations between the levels of RNA expression with NUE, ABST, yield components or vigor related parameters various plant characteristics of 18 different Tomato varieties were analyzed.

Among them, 10 varieties encompassing the observed variance were selected for RNA expression analysis. The correlation between the RNA levels and the characterized parameters was analyzed using Pearson correlation test [davidmlane (dot) com/hyperstat/A34739 (dot) html].

Correlation of Tomato Varieties Across Ecotypes Grown Under Low Nitrogen, Drought and Regular Growth Conditions

#### Experimental Procedures:

10 Tomato varieties were grown in 3 repetitive blocks, each containing 6 plants per plot were grown at net house. Briefly, the growing protocol was as follows:

1. Regular growth conditions: Tomato varieties were grown under normal conditions (4-6 Liters/m<sup>2</sup> of water per day and fertilized with NPK as recommended in protocols for commercial tomato production).

2. Low Nitrogen fertilization conditions: Tomato varieties were grown under normal conditions (4-6 Liters/m<sup>2</sup> per day and fertilized with NPK as recommended in protocols for commercial tomato production) until flower stage. At this time, Nitrogen fertilization was stopped.

3. Drought stress: Tomato variety was grown under normal conditions (4-6 Liters/m<sup>2</sup> per day) until flower stage. At this time, irrigation was reduced to 50% compared to normal conditions.

Plants were phenotyped on a daily basis following the standard descriptor of tomato (Table 63). Harvest was conducted while 50% of the fruits were red (mature). Plants were separated to the vegetative part and fruits, of them, 2 nodes were analyzed for additional inflorescent parameters such as size, number of flowers, and inflorescent weight. Fresh weight of all vegetative material was measured. Fruits were separated to colors (red vs. green) and in accordance with the fruit size (small, medium and large). Next, analyzed data was saved to text files and processed using the JMP

statistical analysis software (SAS institute). Data parameters collected are summarized in Tables 64-70, hereinbelow.

#### Analyzed Tomato Tissues—

Two tissues at different developmental stages [flower and leaf], representing different plant characteristics, were sampled and RNA was extracted as described above. For convenience, each micro-array expression information tissue type has received a Set ID as summarized in Table 62 below.

TABLE 62

| Tomato transcriptom expression sets |                             |
|-------------------------------------|-----------------------------|
| Set ID                              | Expression Set              |
| 1                                   | Tomato field/NUE/leaf       |
| 2                                   | Tomato field/NUE/flower     |
| 3                                   | Tomato field/Drought/leaf   |
| 4                                   | Tomato field/Normal/leaf    |
| 5                                   | Tomato field/Normal/flower  |
| 6                                   | Tomato field/Drought/flower |
| 7                                   | Tomato field Drought leaf   |
| 8                                   | Tomato field Drought flower |
| 9                                   | Tomato field NUE leaf       |
| 10                                  | Tomato field NUE flower     |
| 11                                  | Tomato field Normal leaf    |
| 12                                  | Tomato field Normal flower  |

Table 62: Provided are the identification (ID) letters of each of the tomato expression sets.

Table 63 provides the tomato correlated parameters (Vectors). The average for each of the measured parameter was calculated using the JMP software and values are summarized in Tables 64-70 below. Subsequent correlation analysis was conducted (Table 71). Results were integrated to the database.

TABLE 63

| Tomato correlated parameters (vectors) |                |
|----------------------------------------|----------------|
| Correlated parameter with              | Correlation ID |
| 100 weight green fruit (Drought) [kg]  | 1              |
| 100 weight green fruit (Low N) [kg]    | 2              |
| 100 weight green fruit (Normal) [kg]   | 3              |
| 100 weight red fruit (Drought) [kg]    | 4              |
| 100 weight red fruit (Low N) [kg]      | 5              |
| 100 weight red fruit (Normal) [kg]     | 6              |
| Cluster Weight NUE/Normal [kg]         | 7              |
| FW NUE/Normal [gr.]                    | 8              |
| FW drought/Normal [gr.]                | 9              |
| FW/Plant (NUE) [gr.]                   | 10             |
| FW/Plant (Normal) [gr.]                | 11             |
| FW/Plant Drought [gr.]                 | 12             |
| Fruit Drought/NUE [gr.]                | 13             |

TABLE 63-continued

| Tomato correlated parameters (vectors)       |                |
|----------------------------------------------|----------------|
| Correlated parameter with                    | Correlation ID |
| Fruit NUE/Normal [gr.]                       | 14             |
| Fruit Yield Drought/Normal [gr.]             | 15             |
| Fruit Yield/Plant (NUE) [gr.]                | 16             |
| Fruit Yield/Plant Drought [gr.]              | 17             |
| Fruit yield/Plant (Normal) [gr.]             | 18             |
| HI [yield/yield + biomass] (Low N)           | 19             |
| HI [yield/yield + biomass] (Normal)          | 20             |
| Leaflet Length [cm] (Low N) [cm]             | 21             |
| Leaflet Length [cm] (Normal) [cm]            | 22             |
| Leaflet Length [cm] (Drought) [cm]           | 23             |
| Leaflet Width (Low N) [cm]                   | 24             |
| Leaflet Width (Normal) [cm]                  | 25             |
| Leaflet Width [cm] (Drought) [cm]            | 26             |
| NUE [yield/SPAD] (Low N)                     | 27             |
| NUE [yield/SPAD] (Normal)                    | 28             |
| NUE2 [total biomass/SPAD] (Low N)            | 29             |
| NUE2 [total biomass/SPAD] (Normal)           | 30             |
| NUpE [biomass/SPAD] (Low N)                  | 31             |
| NUpE [biomass/SPAD] (Normal)                 | 32             |
| No flowers (NUE)                             | 33             |
| No flowers (Normal)                          | 34             |
| Num of Flower Drought/NUE                    | 35             |
| Num of Flower Drought/Normal                 | 36             |
| Num of flowers (Drought)                     | 37             |
| Num. Flowers NUE/Normal                      | 38             |
| RWC (Normal) [%]                             | 39             |
| RWC Drought [%]                              | 40             |
| RWC Drought/Normal [%]                       | 41             |
| RWC NUE [%]                                  | 42             |
| RWC NUE/Normal [%]                           | 43             |
| SAPD 100% RWC NUE/Normal [SPAD unit]         | 44             |
| SLA [leaf area/plant biomass] (Low N)        | 45             |
| SLA [leaf area/plant biomass] (Normal)       | 46             |
| SPAD (Normal) [SPAD unit]                    | 47             |
| SPAD 100% RWC (NUE) [SPAD unit]              | 48             |
| SPAD 100% RWC (Normal) [SPAD unit]           | 49             |
| SPAD NUE [SPAD unit]                         | 50             |
| SPAD NUE/Normal [SPAD unit]                  | 51             |
| Total Leaf Area [cm <sup>2</sup> ] (Low N)   | 52             |
| Total Leaf Area [cm <sup>2</sup> ] (Normal)  | 53             |
| Total Leaf Area [cm <sup>2</sup> ] (Drought) | 54             |
| Weight Flower clusters (Normal) [gr.]        | 55             |
| Weight clusters (flowers) (NUE) [gr.]        | 56             |
| Weight flower clusters (Drought) [gr.]       | 57             |
| Yield/SLA (Low N)                            | 58             |
| Yield/SLA (Normal)                           | 59             |
| Yield/total leaf area (Low N)                | 60             |
| Yield/total leaf area (Normal)               | 61             |
| average red fruit weight (NUE) [gr.]         | 62             |
| average red fruit weight (Normal) [gr.]      | 63             |
| average red fruit weight Drought [gr.]       | 64             |
| flower cluster weight Drought/NUE [gr.]      | 65             |

TABLE 63-continued

| Tomato correlated parameters (vectors)     |                |
|--------------------------------------------|----------------|
| Correlated parameter with                  | Correlation ID |
| flower cluster weight Drought/Normal [gr.] | 66             |
| red fruit weight Drought/Normal [gr.]      | 67             |

Table 63. Provided are the tomato correlated parameters.

“gr.” = grams;

“FW” = fresh weight;

“NUE” = nitrogen use efficiency;

“RWC” = relative water content;

“NUpE” = nitrogen uptake efficiency;

“SPAD” = chlorophyll levels;

“HI” = harvest index (vegetative weight divided on yield);

“SLA” = specific leaf area (leaf area divided by leaf dry weight).

Fruit Yield (grams)—At the end of the experiment [when 50% of the fruit were ripe (red)] all fruits from plots within blocks A-C were collected. The total fruits were counted and weighted. The average fruits weight was calculated by dividing the total fruit weight by the number of fruits.

Yield/SLA and Yield/total leaf area—Fruit yield divided by the specific leaf area or the total leaf area gives a measurement of the balance between reproductive and vegetative processes.

Plant Fresh Weight (grams)—At the end of the experiment [when 50% of the fruit were ripe (red)] all plants from plots within blocks A-C were collected. Fresh weight was measured (grams).

Inflorescence Weight (grams)—At the end of the experiment [when 50% of the fruits were ripe (red)] two inflorescence from plots within blocks A-C were collected. The inflorescence weight (gr.) and number of flowers per inflorescence were counted.

SPAD—Chlorophyll content was determined using a Minolta SPAD 502 chlorophyll meter and measurement was performed at time of flowering. SPAD meter readings were done on young fully developed leaf. Three measurements per leaf were taken per plot.

Water use efficiency (WUE)—can be determined as the biomass produced per unit transpiration. To analyze WUE, leaf relative water content was measured in control and transgenic plants. Fresh weight (FW) was immediately recorded; then leaves were soaked for 8 hours in distilled water at room temperature in the dark, and the turgid weight (TW) was recorded. Total dry weight (DW) was recorded after drying the leaves at 60° C. to a constant weight. Relative water content (RWC) was calculated according to the following Formula 1 [(FW-DW/TW-DW)×100] as described above.

Plants that maintain high relative water content (RWC) compared to control lines were considered more tolerant to drought than those exhibiting reduced relative water content.

#### Experimental Results

TABLE 64

| Measured parameters in Tomato accessions under drought conditions |         |       |       |       |       |       |       |        |        |       |       |       |
|-------------------------------------------------------------------|---------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|-------|
| line ID                                                           | Cor. ID |       |       |       |       |       |       |        |        |       |       |       |
|                                                                   | 9       | 12    | 13    | 15    | 17    | 35    | 36    | 37     | 40     | 41    | 57    | 64    |
| Line-1                                                            | 1.717   | 2.620 | 1.151 | 0.565 | 0.467 | 0.877 | 2.941 | 16.667 | 72.120 | 0.990 | 0.368 | 0.009 |
| Line-2                                                            | 0.344   | 1.092 | 0.732 | 1.415 | 0.483 | 1.219 | 0.336 | 6.500  | 74.510 | 0.974 | 0.407 | 0.195 |
| Line-3                                                            | 0.611   | 1.847 | 1.321 | 1.274 | 0.629 | 1.741 | 2.474 | 15.667 | 65.330 | 1.016 | 0.325 | 0.209 |
| Line-4                                                            | 2.630   | 2.221 | 0.756 | 2.876 | 0.347 | 1.564 | 2.652 | 20.333 | 72.220 | 1.077 | 0.288 | 0.005 |
| Line-5                                                            | 1.177   | 2.634 | 1.513 | 4.201 | 2.044 | 1.094 | 1.207 | 11.667 | 66.130 | 1.207 | 0.551 | 0.102 |
| Line-6                                                            | 1.365   | 2.708 | 0.705 | 0.550 | 0.250 | 1.520 | 3.040 | 25.333 | 68.303 | 0.880 | 0.311 | 0.002 |
| Line-7                                                            | 4.018   | 3.406 | 5.063 | 0.085 | 0.045 | 4.956 | 5.947 | 29.733 | 78.130 | 1.343 | 0.445 | 0.035 |
| Line-8                                                            | 1.010   | 2.108 | 0.891 | 1.030 | 0.453 | 1.083 | 2.080 | 17.333 | 18.460 | 0.278 | 0.555 | 0.006 |

TABLE 64-continued

| Measured parameters in Tomato accessions under drought conditions |       |       |       |       |       |       |       |        |        |       |       |       |
|-------------------------------------------------------------------|-------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|-------|
| Cor. ID                                                           |       |       |       |       |       |       |       |        |        |       |       |       |
| line ID                                                           | 9     | 12    | 13    | 15    | 17    | 35    | 36    | 37     | 40     | 41    | 57    | 64    |
| Line-9                                                            | 0.608 | 1.948 | 0.671 | 1.392 | 0.292 | 0.978 | 1.467 | 14.667 | 73.210 | 1.131 | 0.304 | 0.005 |
| Line-10                                                           | 0.640 | 1.763 | 2.171 | 3.280 | 1.017 | 4.944 | 4.238 | 29.667 | 62.500 | 0.831 | 0.315 | 0.005 |
| Line-11                                                           | 0.950 | 1.721 | 0.377 | 0.906 | 0.600 | 0.882 | 1.667 | 15.000 | 67.210 | 1.015 | 0.308 | 0.005 |
| Line-12                                                           | 0.510 | 1.923 | 1.273 | 2.618 | 0.494 | 0.795 | 1.292 | 10.333 | 75.760 | 1.199 | 0.311 | 0.012 |
| Line-13                                                           | 1.168 | 2.206 | 0.842 | 0.319 | 0.272 | 2.115 | 3.438 | 18.333 | 62.820 | 1.107 | 8.360 | 0.005 |
| Line-14                                                           | 1.938 | 3.731 | 1.512 | 2.484 | 0.679 | 1.286 | 1.500 | 12.000 | 70.690 | 1.966 | 0.288 | 0.006 |
| Line-15                                                           | 0.352 | 0.754 | 0.984 | 0.405 | 0.140 | 1.605 | 2.652 | 20.333 | 55.750 | 0.718 | 0.342 | 0.303 |
| Line-16                                                           | 1.063 | 1.757 | 1.337 | 1.619 | 0.529 | 1.900 | 1.407 | 12.667 | 75.220 | 0.752 | 0.441 | 0.138 |
| Line-17                                                           | 0.208 | 0.626 | 0.384 | 1.763 | 0.554 | 1.357 | 1.188 | 12.667 | 63.680 | 1.008 | 0.268 | 0.040 |
| Line-18                                                           | 0.483 | 1.109 | 0.837 | 1.424 | 0.414 | 1.417 | 1.259 | 11.333 | 62.310 | 0.829 | 0.426 | 0.089 |

Table 64: Provided are the values of each of the parameters (as described above) measured in Sorghum accessions (line ID) under drought growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 65

| Additional Measured parameters in Tomato accessions under drought conditions |        |       |        |         |         |         |         |         |  |
|------------------------------------------------------------------------------|--------|-------|--------|---------|---------|---------|---------|---------|--|
| Cor. ID                                                                      |        |       |        |         |         |         |         |         |  |
| line ID                                                                      | 65     | 66    | 67     | 1       | 4       | 23      | 26      | 54      |  |
| Line-1                                                                       | 0.689  | 0.315 | 0.193  |         |         |         |         |         |  |
| Line-2                                                                       | 1.110  | 1.190 | 24.373 |         |         |         |         |         |  |
| Line-3                                                                       | 1.060  | 0.469 | 25.384 |         |         |         |         |         |  |
| Line-4                                                                       | 0.823  | 0.005 | 0.016  |         |         |         |         |         |  |
| Line-5                                                                       | 1.163  | 1.252 | 20.259 |         |         |         |         |         |  |
| Line-6                                                                       | 1.250  | 0.028 | 0.036  |         |         |         |         |         |  |
| Line-7                                                                       | 1.517  | 0.563 | 0.150  |         |         |         |         |         |  |
| Line-8                                                                       | 1.190  | 0.963 | 0.022  |         |         |         |         |         |  |
| Line-9                                                                       | 0.759  | 0.416 | 0.863  |         |         |         |         |         |  |
| Line-10                                                                      | 1.039  | 0.378 | 0.737  |         |         |         |         |         |  |
| Line-11                                                                      | 0.376  | 0.358 | 0.090  |         |         |         |         |         |  |
| Line-12                                                                      | 0.778  | 0.622 | 1.715  | 0.8     | 0.88667 | 5.1504  | 2.55142 | 337.63  |  |
| Line-13                                                                      | 24.115 | 8.196 | 0.171  | 0.28    | 0.34667 | 3.38139 | 2.04437 | 130.779 |  |
| Line-14                                                                      | 0.673  | 0.411 | 0.024  | 0.38    | 0.62667 | 7.13977 | 4.16522 | 557.927 |  |
| Line-15                                                                      | 0.967  | 0.907 | 10.501 | 0.63333 | 2.27    | 5.47615 | 3.08653 | 176.671 |  |
| Line-16                                                                      | 0.988  | 0.669 | 27.890 | 2.86    | 7.4     | 8.62307 | 4.69436 | 791.863 |  |
| Line-17                                                                      | 0.949  | 0.383 | 11.789 | 1.16    | 2.94    | 6.34602 | 3.86722 | 517.049 |  |
| Line-18                                                                      | 0.907  | 1.305 | 9.979  | 4.39667 | 11.6    | 6.77153 | 2.9104  | 832.265 |  |

Table 65: Provided are the values of each of the parameters (as described above) measured in Tomato accessions (line ID) under drought conditions. Growth conditions are specified in the experimental procedure section.

TABLE 66

| Measured parameters in Tomato accessions under low nitrogen conditions |       |       |       |       |       |        |       |         |       |       |        |
|------------------------------------------------------------------------|-------|-------|-------|-------|-------|--------|-------|---------|-------|-------|--------|
| Cor. ID                                                                |       |       |       |       |       |        |       |         |       |       |        |
| line ID                                                                | 7     | 8     | 10    | 14    | 16    | 33     | 38    | 42      | 43    | 44    | 48     |
| Line-1                                                                 | 0.457 | 2.649 | 4.041 | 0.491 | 0.406 | 19.000 | 3.353 | 74.070  | 1.017 | 0.787 | 28.469 |
| Line-2                                                                 | 1.072 | 0.382 | 1.213 | 1.932 | 0.660 | 5.333  | 0.276 | 99.080  | 1.296 | 1.372 | 39.039 |
| Line-3                                                                 | 0.442 | 0.743 | 2.246 | 0.965 | 0.477 | 9.000  | 1.421 | 69.490  | 1.081 | 0.920 | 33.009 |
| Line-4                                                                 | 0.006 | 3.008 | 2.540 | 3.802 | 0.458 | 13.000 | 1.696 | 63.240  | 0.943 | 0.753 | 23.418 |
| Line-5                                                                 | 1.076 | 0.827 | 1.850 | 2.776 | 1.351 | 10.667 | 1.103 | 77.360  | 1.412 | 1.309 | 34.528 |
| Line-6                                                                 | 0.022 | 1.544 | 3.063 | 0.780 | 0.354 | 16.667 | 2.000 | 77.910  | 1.004 | 0.965 | 32.513 |
| Line-7                                                                 | 0.371 | 3.697 | 3.134 | 0.017 | 0.009 | 6.000  | 1.200 | 80.490  | 1.383 | 1.107 | 27.661 |
| Line-8                                                                 | 0.809 | 1.218 | 2.542 | 1.157 | 0.509 | 16.000 | 1.920 | 67.400  | 1.013 | 0.949 | 33.676 |
| Line-9                                                                 | 0.548 | 0.575 | 1.844 | 2.074 | 0.436 | 15.000 | 1.500 | 67.160  | 1.038 | 0.793 | 30.045 |
| Line-10                                                                | 0.364 | 0.551 | 1.517 | 1.511 | 0.468 | 6.000  | 0.857 | 66.070  | 0.878 | 0.924 | 35.502 |
| Line-11                                                                | 0.953 | 1.056 | 1.913 | 2.406 | 1.593 | 17.000 | 1.889 | 69.570  | 1.050 | 0.937 | 24.812 |
| Line-12                                                                | 0.800 | 0.492 | 1.856 | 2.056 | 0.388 | 13.000 | 1.625 | 69.300  | 1.096 | 1.356 | 40.771 |
| Line-13                                                                | 0.340 | 1.310 | 2.472 | 0.379 | 0.323 | 8.667  | 1.625 | 100.000 | 1.761 | 1.443 | 47.467 |

TABLE 66-continued

| Measured parameters in Tomato accessions under low nitrogen conditions |         |       |       |       |       |        |       |        |       |       |        |
|------------------------------------------------------------------------|---------|-------|-------|-------|-------|--------|-------|--------|-------|-------|--------|
| line ID                                                                | Cor. ID |       |       |       |       |        |       |        |       |       |        |
|                                                                        | 7       | 8     | 10    | 14    | 16    | 33     | 38    | 42     | 43    | 44    | 48     |
| Line-14                                                                | 0.611   | 1.361 | 2.621 | 1.642 | 0.449 | 9.333  | 1.167 | 57.660 | 1.603 | 1.502 | 26.064 |
| Line-15                                                                | 0.938   | 0.506 | 1.084 | 0.412 | 0.143 | 12.667 | 1.652 | 90.790 | 1.170 | 1.046 | 35.378 |
| Line-16                                                                | 0.677   | 0.705 | 1.166 | 1.211 | 0.396 | 6.667  | 0.741 | 68.000 | 0.680 | 0.562 | 30.600 |
| Line-17                                                                | 0.404   | 0.306 | 0.921 | 4.587 | 1.442 | 9.333  | 0.875 | 59.650 | 0.944 | 1.484 | 38.971 |
| Line-18                                                                | 1.439   | 0.474 | 1.088 | 1.700 | 0.495 | 8.000  | 0.889 | 72.170 | 0.961 | 0.843 | 37.456 |

Table 66: Provided are the values of each of the parameters (as described above) measured in Tomato accessions (Seed ID) under low nitrogen growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 67

| Additional measured parameters in Tomato accessions under low nitrogen conditions |         |       |       |       |         |         |         |         |         |         |         |
|-----------------------------------------------------------------------------------|---------|-------|-------|-------|---------|---------|---------|---------|---------|---------|---------|
| line ID                                                                           | Cor. ID |       |       |       |         |         |         |         |         |         |         |
|                                                                                   | 50      | 51    | 56    | 62    | 2       | 19      | 21      | 24      | 27      | 29      | 31      |
| Line-1                                                                            | 38.400  | 0.773 | 0.533 | 0.024 | 0.87    | 0.0912  | 6.39865 | 3.46688 | 0.01425 | 0.15619 | 0.14195 |
| Line-2                                                                            | 39.400  | 1.059 | 0.367 | 0.191 | 3.66333 | 0.35231 | 5.92027 | 1.97373 | 0.01691 | 0.04799 | 0.03108 |
| Line-3                                                                            | 47.500  | 0.851 | 0.307 | 0.006 | 0.56667 | 0.1751  | 3.68636 | 1.78501 | 0.01444 | 0.08247 | 0.06803 |
| Line-4                                                                            | 37.000  | 0.797 | 0.350 | 0.005 | 0.37    | 0.15286 | 5.42713 | 2.55198 | 0.01957 | 0.12803 | 0.10846 |
| Line-5                                                                            | 44.600  | 0.925 | 0.473 | 0.096 | 3.40333 | 0.42208 | 6.95119 | 3.51776 | 0.03913 | 0.09271 | 0.05358 |
| Line-6                                                                            | 41.700  | 0.961 | 0.249 | 0.004 | 0.68333 | 0.10371 | 3.73374 | 1.73101 | 0.0109  | 0.10512 | 0.09422 |
| Line-7                                                                            | 34.400  | 0.802 | 0.293 | 0.006 | 0.45333 | 0.00283 | 4.38515 | 1.87221 | 0.00032 | 0.11364 | 0.11332 |
| Line-8                                                                            | 50.000  | 0.938 | 0.467 | 0.007 | 0.47333 | 0.16679 | 6.72386 | 3.54186 | 0.01511 | 0.0906  | 0.07549 |
| Line-9                                                                            | 44.700  | 0.764 | 0.400 | 0.006 | 0.54    | 0.19103 | 6.65657 | 3.27815 | 0.0145  | 0.07589 | 0.06139 |
| Line-10                                                                           | 53.700  | 1.051 | 0.303 | 0.013 | 0.39333 | 0.23594 | 4.38654 | 2.5225  | 0.01319 | 0.05591 | 0.04272 |
| Line-11                                                                           | 35.700  | 0.893 | 0.820 | 0.021 | 0.97    | 0.45446 | 3.90107 | 2.60788 | 0.06422 | 0.1413  | 0.07709 |
| Line-12                                                                           | 58.800  | 1.235 | 0.400 | 0.005 | 0.91333 | 0.17306 | 5.29057 | 2.61233 | 0.00952 | 0.05504 | 0.04551 |
| Line-13                                                                           | 47.500  | 0.820 | 0.347 | 0.006 | 0.36333 | 0.11548 | 6.31683 | 3.57772 | 0.0068  | 0.05888 | 0.05208 |
| Line-14                                                                           | 45.200  | 0.936 | 0.428 | 0.047 | 0.34667 | 0.14622 | 5.1126  | 2.5642  | 0.01722 | 0.11779 | 0.10056 |
| Line-15                                                                           | 39.000  | 0.894 | 0.353 | 0.357 | 0.56667 | 0.11634 | 4.72494 | 2.48302 | 0.00404 | 0.03469 | 0.03065 |
| Line-16                                                                           | 45.000  | 0.826 | 0.447 | 0.037 | 4.38333 | 0.25338 | 6.83245 | 3.43048 | 0.01293 | 0.05102 | 0.03809 |
| Line-17                                                                           | 65.300  | 1.570 | 0.283 | 0.626 | 2.02    | 0.61025 | 7.09701 | 3.29874 | 0.03701 | 0.06064 | 0.02364 |
| Line-18                                                                           | 51.900  | 0.878 | 0.470 |       | 8.13    | 0.31274 | 8.21338 | 3.68939 | 0.01322 | 0.04226 | 0.02904 |

Table 67: Provided are the values of each of the parameters (as described above) measured in Tomato accessions (Seed ID) under low nitrogen growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 68

| Additional measured parameters in Tomato accessions under low nitrogen conditions |         |         |         |         |         |
|-----------------------------------------------------------------------------------|---------|---------|---------|---------|---------|
| line ID/<br>Cor. ID                                                               | 45      | 52      | 58      | 60      | 5       |
| Line-1                                                                            | 140.044 | 565.932 | 0.0029  | 0.00072 | 1.06    |
| Line-2                                                                            | 317.118 | 384.77  | 0.00208 | 0.00172 | 6.86667 |
| Line-3                                                                            | 131.293 | 294.827 | 0.00363 | 0.00162 | 0.64667 |
| Line-4                                                                            | 148.817 | 377.995 | 0.00308 | 0.00121 | 0.53    |
| Line-5                                                                            | 257.51  | 476.393 | 0.00525 | 0.00284 | 7.17333 |
| Line-6                                                                            | 64.3367 | 197.085 | 0.00551 | 0.0018  | 0.44    |
| Line-7                                                                            | 144.599 | 453.236 | 6.1E-05 | 2E-05   |         |

TABLE 68-continued

| Additional measured parameters in Tomato accessions under low nitrogen conditions |         |         |         |         |         |
|-----------------------------------------------------------------------------------|---------|---------|---------|---------|---------|
| line ID/<br>Cor. ID                                                               | 45      | 52      | 58      | 60      | 5       |
| Line-8                                                                            | 246.05  | 625.515 | 0.00207 | 0.00081 | 0.55333 |
| Line-9                                                                            | 405.548 | 748.01  | 0.00107 | 0.00058 | 0.74667 |
| Line-10                                                                           | 299.316 | 453.962 | 0.00156 | 0.00103 | 0.58    |
| Line-11                                                                           | 86.1901 | 164.853 | 0.01849 | 0.00967 | 1.26667 |
| Line-12                                                                           | 182.319 | 338.303 | 0.00213 | 0.00115 | 1.34    |

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TABLE 68-continued

| Additional measured parameters in Tomato accessions<br>under low nitrogen conditions |         |         |         |         |         |
|--------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|
| line ID/<br>Cor. ID                                                                  | 45      | 52      | 58      | 60      | 5       |
| Line-13                                                                              | 160.178 | 395.995 | 0.00202 | 0.00082 | 0.52    |
| Line-14                                                                              | 90.0951 | 236.149 | 0.00498 | 0.0019  | 0.57333 |
| Line-15                                                                              | 160.99  | 174.585 | 0.00089 | 0.00082 | 0.94333 |
| Line-16                                                                              | 379.028 | 441.778 | 0.00104 | 0.0009  | 6.17    |

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TABLE 68-continued

| Additional measured parameters in Tomato accessions<br>under low nitrogen conditions |         |         |         |         |         |
|--------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|
| line ID/<br>Cor. ID                                                                  | 45      | 52      | 58      | 60      | 5       |
| Line-17                                                                              | 531.079 | 489.183 | 0.00272 | 0.00295 | 3.67333 |
| Line-18                                                                              | 650.684 | 707.8   | 0.00076 | 0.0007  | 11.325  |

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Table 68: Provided are the values of each of the parameters (as described above) measured in Tomato accessions (Seed ID) under low nitrogen growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 69

| Measured parameters in Tomato accessions under normal conditions |         |       |        |         |        |        |        |       |       |       |
|------------------------------------------------------------------|---------|-------|--------|---------|--------|--------|--------|-------|-------|-------|
| line ID                                                          | Cor. ID |       |        |         |        |        |        |       |       |       |
|                                                                  | 11      | 18    | 34     | 39      | 47     | 49     | 55     | 63    | 20    | 28    |
| Line-1                                                           | 1.526   | 0.826 | 5.667  | 72.830  | 49.700 | 36.170 | 1.167  | 0.048 | 0.351 | 0.017 |
| Line-2                                                           | 3.174   | 0.342 | 19.333 | 76.470  | 37.200 | 28.447 | 0.342  | 0.008 | 0.097 | 0.009 |
| Line-3                                                           | 3.022   | 0.494 | 6.333  | 64.290  | 55.800 | 35.893 | 0.693  | 0.008 | 0.140 | 0.009 |
| Line-4                                                           | 0.844   | 0.121 | 7.667  | 67.070  | 46.400 | 31.085 | 56.348 | 0.286 | 0.125 | 0.003 |
| Line-5                                                           | 2.238   | 0.487 | 9.667  | 54.790  | 48.200 | 26.384 | 0.440  | 0.005 | 0.179 | 0.010 |
| Line-6                                                           | 1.984   | 0.454 | 8.333  | 77.610  | 43.400 | 33.684 | 11.313 | 0.054 | 0.186 | 0.010 |
| Line-7                                                           | 0.848   | 0.529 | 5.000  | 58.180  | 42.900 | 24.979 | 0.790  | 0.231 | 0.384 | 0.012 |
| Line-8                                                           | 2.088   | 0.440 | 8.333  | 66.510  | 53.300 | 35.472 | 0.577  | 0.290 | 0.174 | 0.008 |
| Line-9                                                           | 3.206   | 0.210 | 10.000 | 64.710  | 58.500 | 37.875 | 0.730  | 0.006 | 0.061 | 0.004 |
| Line-10                                                          | 2.754   | 0.310 | 7.000  | 75.250  | 51.100 | 38.426 | 0.833  | 0.007 | 0.101 | 0.006 |
| Line-11                                                          | 1.811   | 0.662 | 9.000  | 66.230  | 40.000 | 26.494 | 0.860  | 0.058 | 0.268 | 0.017 |
| Line-12                                                          | 3.770   | 0.189 | 8.000  | 63.210  | 47.600 | 30.066 | 0.500  | 0.007 | 0.048 | 0.004 |
| Line-13                                                          | 1.888   | 0.852 | 5.333  | 56.770  | 57.900 | 32.889 | 1.020  | 0.026 | 0.311 | 0.015 |
| Line-14                                                          | 1.926   | 0.273 | 8.000  | 35.960  | 48.300 | 17.354 | 0.700  | 0.261 | 0.124 | 0.006 |
| Line-15                                                          | 2.143   | 0.347 | 7.667  | 77.620  | 43.600 | 33.818 | 0.377  | 0.029 | 0.139 | 0.008 |
| Line-16                                                          | 1.652   | 0.327 | 9.000  | 100.000 | 54.500 | 54.467 | 0.660  | 0.005 | 0.165 | 0.006 |
| Line-17                                                          | 3.011   | 0.314 | 10.667 | 63.160  | 41.600 | 26.253 | 0.700  | 0.003 | 0.095 | 0.008 |
| Line-18                                                          | 2.294   | 0.291 | 9.000  | 75.130  | 59.100 | 44.427 | 0.327  | 0.009 | 0.113 | 0.005 |

Table 69: Provided are the values of each of the parameters (as described above) measured in Tomato accessions (lined ID) under normal growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 70

| Additional measured parameters in Tomato accessions under normal conditions |         |       |         |         |          |         |         |         |         |         |
|-----------------------------------------------------------------------------|---------|-------|---------|---------|----------|---------|---------|---------|---------|---------|
| line ID                                                                     | Cor. ID |       |         |         |          |         |         |         |         |         |
|                                                                             | 30      | 32    | 3       | 6       | 22       | 25      | 46      | 53      | 59      | 61      |
| Line-1                                                                      | 0.047   | 0.031 |         |         |          |         |         |         |         |         |
| Line-2                                                                      | 0.095   | 0.085 |         |         |          |         |         |         |         |         |
| Line-3                                                                      | 0.063   | 0.054 | 0.55667 | 0.82333 | 6.34284  | 3.69046 | 140.989 | 426.099 | 0.0035  | 0.00116 |
| Line-4                                                                      | 0.021   | 0.018 | 3.05333 | 2.45667 | 7.98803  | 4.76756 | 689.665 | 582.384 | 0.00017 | 0.00021 |
| Line-5                                                                      | 0.057   | 0.046 | 0.24    | 0.50333 | 5.59331  | 3.43357 | 130.22  | 291.403 | 0.00374 | 0.00167 |
| Line-6                                                                      | 0.056   | 0.046 | 2.57667 | 2.76    | 7.69722  | 4.56061 | 299.118 | 593.583 | 0.00152 | 0.00077 |
| Line-7                                                                      | 0.032   | 0.020 | 6.32333 | 5.31667 | 7.84568  | 4.43534 | 1117.74 | 947.594 | 0.00047 | 0.00056 |
| Line-8                                                                      | 0.047   | 0.039 | 5.75333 | 5.24    | 6.21698  | 3.15039 | 111.77  | 233.352 | 0.00394 | 0.00189 |
| Line-9                                                                      | 0.058   | 0.055 | 0.37667 | 0.61    | 6.159    | 3.36888 | 106.294 | 340.731 | 0.00198 | 0.00062 |
| Line-10                                                                     | 0.060   | 0.054 | 0.29667 | 0.66    | 5.652    | 3.13112 | 123.139 | 339.111 | 0.00252 | 0.00091 |
| Line-11                                                                     | 0.062   | 0.045 | 1.95333 | 2.70333 | 4.39488  | 2.39632 | 104.986 | 190.141 | 0.00631 | 0.00348 |
| Line-12                                                                     | 0.083   | 0.079 | 2.53333 | 0.7     | 4.441.38 | 2.02436 | 111.88  | 421.789 | 0.00169 | 0.00045 |
| Line-13                                                                     | 0.047   | 0.033 | 1.42333 | 2.64    | 6.7696   | 3.8002  | 307.946 | 581.334 | 0.00277 | 0.00147 |
| Line-14                                                                     | 0.046   | 0.040 | 2.03    | 4.67    | 7.41586  | 3.7433  | 419.365 | 807.511 | 0.00065 | 0.00034 |
| Line-15                                                                     | 0.057   | 0.049 | 1.385   | 2.16667 | 6.70898  | 2.97523 | 365.812 | 784.056 | 0.00095 | 0.00044 |
| Line-16                                                                     | 0.036   | 0.030 | 2.27    | 0.49333 | 5.86525  | 3.21956 | 212.926 | 351.801 | 0.00153 | 0.00093 |
| Line-17                                                                     | 0.080   | 0.072 | 0.45    | 0.34333 | 4.16     | 2.08898 | 84.9441 | 255.776 | 0.0037  | 0.00123 |
| Line-18                                                                     | 0.044   | 0.039 | 0.41667 | 0.75333 | 10.2902  | 5.91228 | 469.874 | 1078.1  | 0.00062 | 0.00027 |

Table 70: Provided are the values of each of the parameters (as described above) measured in Tomato accessions (line ID) under normal growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 71

Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under normal and stress conditions across tomato ecotypes

| Gene Name | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
|-----------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| LNU971    | 0.830 | 5.67E-03 | 11       | 32          | LNU971    | 0.836 | 5.02E-03 | 11       | 30          |
| LNU971    | 0.730 | 1.66E-02 | 10       | 52          | LNU971    | 0.986 | 1.83E-07 | 1        | 55          |
| LNU972    | 0.787 | 1.18E-02 | 11       | 20          | LNU972    | 0.802 | 9.36E-03 | 11       | 28          |
| LNU972    | 0.782 | 2.19E-02 | 12       | 59          | LNU972    | 0.783 | 2.15E-02 | 12       | 61          |
| LNU973    | 0.793 | 6.26E-03 | 3        | 43          | LNU973    | 0.773 | 2.44E-02 | 12       | 3           |
| LNU973    | 0.825 | 3.31E-03 | 2        | 49          | LNU974    | 0.700 | 2.41E-02 | 10       | 52          |
| LNU975    | 0.739 | 1.45E-02 | 3        | 51          | LNU975    | 0.857 | 3.15E-03 | 3        | 62          |
| LNU975    | 0.927 | 1.12E-04 | 1        | 55          | LNU975    | 0.825 | 3.30E-03 | 1        | 63          |

Table 71. Provided are the correlations (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector (Cor))] under normal and low nitrogen conditions across tomato ecotypes. P = p value.

Correlation of early vigor traits across collection of Tomato ecotypes under Low nitrogen, 300 mM NaCl, and normal growth conditions—Ten tomato hybrids were grown in 3 repetitive plots, each containing 17 plants, at a net house under semi-hydroponics conditions. Briefly, the growing protocol was as follows: Tomato seeds were sown in trays filled with a mix of vermiculite and peat in a 1:1 ratio. Following germination, the trays were transferred to the high salinity solution (300 mM NaCl in addition to the Full Hoagland solution), low nitrogen (“low N”) solution (the amount of total nitrogen was reduced in 90% from the full Hoagland solution, final amount of 0.8 mM N), or at Normal growth solution (Full Hoagland containing 8 mM N solution, grown at 28±2° C.). Plants were grown at 28±2° C.

Full Hoagland solution consists of: KNO<sub>3</sub>—0.808 grams/liter, MgSO<sub>4</sub>—0.12 grams/liter, KH<sub>2</sub>PO<sub>4</sub>—0.172 grams/liter and 0.01% (volume/volume) of ‘Super coratin’ micro elements (Iron-EDDHA [ethylenediamine-N,N'-bis(2-hydroxyphenylacetic acid)]—40.5 grams/liter; Mn—20.2 grams/liter; Zn 10.1 grams/liter; Co 1.5 grams/liter; and Mo 1.1 grams/liter), solution's pH should be 6.5-6.8.

Analyzed tomato tissues—All 10 selected Tomato varieties were sample per each treatment. Three tissues [leaves, meristems and flowers] were sampled and RNA was extracted as described above. For convenience, each microarray expression information tissue type has received a Set ID as summarized in Table 72 below.

TABLE 72

| Tomato transcriptom experimental sets |                |
|---------------------------------------|----------------|
| Set ID                                | Expression Set |
| 1                                     | Normal/leaf    |
| 2                                     | Normal/root    |
| 3                                     | Low N/leaf     |
| 4                                     | Low N/root     |
| 5                                     | Salinity/leaf  |
| 6                                     | Salinity/root  |
| 7                                     | Low N/root     |
| 8                                     | Low N/leaf     |
| 9                                     | Normal/root    |
| 10                                    | Normal/leaf    |
| 11                                    | Salinity/root  |
| 12                                    | Salinity/leaf  |

Table 72. Provided are the tomato transcriptom experimental sets.

Tomato vigor related parameters—following 5 weeks of growing, plant were harvested and analyzed for Leaf num-

ber, plant height, chlorophyll levels (SPAD units), different indices of nitrogen use efficiency (NUE) and plant biomass. Next, analyzed data was saved to text files and processed using the JMP statistical analysis software (SAS institute). Data parameters collected are summarized in Table 73, herein below.

TABLE 73

| Tomato correlated parameters (vectors) |                                                       |
|----------------------------------------|-------------------------------------------------------|
| Correlation ID                         | Correlated parameter with                             |
| 1                                      | Leaf No. Low N/Normal [number]                        |
| 2                                      | Leaf No. NaCl/Normal [number]                         |
| 3                                      | Leaf No. NaCl/Low N [number]                          |
| 4                                      | N level/Leaf [spad unit/leaf]                         |
| 5                                      | NUE roots (Root Biomass [DW]/SPAD)                    |
| 6                                      | NUE shoots (shoot Biomass [DW]/SPAD)                  |
| 7                                      | NUE total biomass (Total Biomass [DW]/SPAD)           |
| 8                                      | Percent Root Biomass reduction compared to normal [%] |
| 9                                      | Percent Shoot Biomass reduction compared to normal[%] |
| 10                                     | Plant Height Low N/Normal [cm]                        |
| 11                                     | Plant Height NaCl/Low N [cm]                          |
| 12                                     | Plant Height NaCl/Normal [cm]                         |
| 13                                     | Plant biomass NaCl [cm]                               |
| 14                                     | Plant height Low N [cm]                               |
| 15                                     | Plant height NaCl [cm]                                |
| 16                                     | Plant height Normal [cm]                              |
| 17                                     | Root Biomass [DW]/SPAD                                |
| 18                                     | SPAD Low N/Normal [SPAD unit]                         |
| 19                                     | SPAD Low N [SPAD unit]                                |
| 20                                     | SPAD Normal [SPAD unit]                               |
| 21                                     | Shoot Biomass [DW]/SPAD                               |
| 22                                     | Shoot/Root                                            |
| 23                                     | Total Biomass [Root + Shoot DW]/SPAD                  |
| 24                                     | height Normal                                         |
| 25                                     | leaf No. Low N                                        |
| 26                                     | leaf No. Normal                                       |
| 27                                     | leaf No. NaCl                                         |

Table 73. Provided are the tomato correlated parameters,.

“DW” = dry weight;

“cm” = centimeter.

“Leaf No.” = leaf number.

### Experimental Results

10 different Tomato varieties were grown and characterized for parameters as described above. The average for each of the measured parameter was calculated using the JMP software and values are summarized in Tables 74-77 below. Subsequent correlation analysis was conducted (Table 78). Follow, results were integrated to the database.

TABLE 74

| Measured parameters in Tomato accessions under low nitrogen conditions |       |       |        |       |        |        |       |        |        |
|------------------------------------------------------------------------|-------|-------|--------|-------|--------|--------|-------|--------|--------|
| Cor. ID                                                                |       |       |        |       |        |        |       |        |        |
| Line                                                                   | 1     | 10    | 14     | 18    | 19     | 24     | 25    | 4      | 5      |
| Line-1                                                                 | 0.850 | 0.810 | 36.780 | 1.010 | 34.570 | 45.330 | 5.560 | 10.854 | 6.990  |
| Line-2                                                                 | 0.900 | 0.830 | 39.890 | 0.980 | 24.870 | 47.780 | 6.220 | 11.409 | 2.540  |
| Line-3                                                                 | 0.980 | 0.840 | 34.440 | 1.020 | 28.580 | 40.780 | 7.220 |        |        |
| Line-4                                                                 | 1.090 | 0.850 | 47.000 | 1.000 | 31.580 | 55.330 | 6.780 | 10.438 | 7.040  |
| Line-5                                                                 | 0.880 | 0.830 | 46.440 | 0.980 | 29.720 | 56.220 | 5.560 | 11.169 | 5.040  |
| Line-6                                                                 | 1.020 | 0.930 | 45.440 | 0.980 | 31.830 | 48.670 | 6.560 | 8.929  | 8.010  |
| Line-7                                                                 | 0.870 | 0.850 | 47.670 | 0.930 | 30.330 | 55.780 | 5.110 | 7.926  | 15.090 |
| Line-8                                                                 | 1.060 | 1.050 | 39.330 | 1.050 | 30.290 | 37.440 | 5.890 | 7.993  | 9.020  |
| Line-9                                                                 | 0.910 | 0.840 | 41.780 | 1.010 | 31.320 | 49.560 | 5.560 | 10.304 | 8.780  |
| Line-10                                                                | 1.120 | 0.880 | 41.000 | 0.990 | 28.770 | 46.330 | 6.330 | 8.585  | 7.250  |
| Line-11                                                                |       |       |        |       |        |        |       | 11.528 | 7.730  |
| Line-12                                                                |       |       |        |       |        |        |       | 14.491 | 15.940 |

Table 74. Provided are the values of each of the parameters (as described above) measured in Tomato accessions (Line) under low nitrogen growth conditions. Growth conditions are specified in the experimental procedure section.

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TABLE 75

| Additional measured parameters in Tomato accessions under low nitrogen conditions |         |        |         |        |       |       |        |       |
|-----------------------------------------------------------------------------------|---------|--------|---------|--------|-------|-------|--------|-------|
| Cor. ID                                                                           |         |        |         |        |       |       |        |       |
| Line                                                                              | 6       | 7      | 8       | 9      | 17    | 21    | 22     | 23    |
| Line-1                                                                            | 35.350  | 58.470 | 62.592  | 75.380 | 0.001 | 0.004 | 5.010  | 0.005 |
| Line-2                                                                            | 24.090  | 63.750 | 54.158  | 55.112 | 0.000 | 0.003 | 11.393 | 0.003 |
| Line-3                                                                            |         |        |         |        |       |       |        |       |
| Line-4                                                                            | 65.020  | 69.290 | 70.547  | 49.726 | 0.001 | 0.007 | 9.494  | 0.008 |
| Line-5                                                                            | 46.710  | 71.100 | 59.685  | 63.189 | 0.001 | 0.005 | 11.600 | 0.005 |
| Line-6                                                                            | 46.670  | 60.540 | 96.129  | 82.667 | 0.001 | 0.005 | 8.200  | 0.006 |
| Line-7                                                                            | 120.070 | 73.900 | 106.502 | 66.924 | 0.001 | 0.011 | 10.375 | 0.013 |
| Line-8                                                                            | 60.090  | 68.810 | 111.905 | 107.98 | 0.001 | 0.007 | 10.523 | 0.008 |
| Line-9                                                                            | 66.270  | 66.740 | 81.644  | 55.401 | 0.001 | 0.007 | 8.242  | 0.008 |
| Line-10                                                                           | 56.460  | 70.820 | 32.214  | 54.433 | 0.001 | 0.007 | 7.967  | 0.008 |
| Line-11                                                                           | 38.350  | 69.700 | 143.714 | 62.155 | 0.001 | 0.004 | 6.414  | 0.005 |
| Line-12                                                                           | 60.320  | 49.720 | 87.471  | 59.746 | 0.001 | 0.006 | 3.909  | 0.007 |

Table 75. Provided are the values of each of the parameters (as described above) measured in Tomato accessions (Line) under low nitrogen growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 76

| Measured parameters in Tomato accessions under normal conditions |        |        |       |        |       |        |       |       |       |        |       |
|------------------------------------------------------------------|--------|--------|-------|--------|-------|--------|-------|-------|-------|--------|-------|
| Corr. ID                                                         |        |        |       |        |       |        |       |       |       |        |       |
| Line                                                             | 16     | 20     | 26    | 4      | 5     | 6      | 7     | 17    | 21    | 22     | 23    |
| Line-1                                                           | 45.330 | 34.300 | 6.560 | 9.293  | 1.120 | 4.690  | 7.470 | 0.001 | 0.005 | 5.400  | 0.006 |
| Line-2                                                           | 47.780 | 25.310 | 6.890 | 8.868  | 0.470 | 4.370  | 8.630 | 0.001 | 0.005 | 10.021 | 0.006 |
| Line-3                                                           | 40.780 | 28.120 | 7.330 |        |       |        |       |       |       |        |       |
| Line-4                                                           | 55.330 | 31.430 | 6.220 | 8.433  | 1.000 | 13.080 | 8.850 | 0.001 | 0.014 | 15.417 | 0.015 |
| Line-5                                                           | 56.220 | 30.240 | 6.330 | 9.827  | 0.840 | 7.390  | 7.220 | 0.001 | 0.008 | 8.833  | 0.009 |
| Line-6                                                           | 48.670 | 32.430 | 6.440 | 8.573  | 0.830 | 5.650  | 7.870 | 0.001 | 0.005 | 7.519  | 0.006 |
| Line-7                                                           | 55.780 | 32.580 | 5.890 | 6.567  | 0.940 | 17.940 | 9.090 | 0.001 | 0.017 | 12.611 | 0.019 |
| Line-8                                                           | 37.440 | 28.770 | 5.560 | 6.968  | 0.810 | 5.560  | 7.910 | 0.001 | 0.007 | 7.989  | 0.008 |
| Line-9                                                           | 49.560 | 30.920 | 6.110 | 8.710  | 1.080 | 11.960 | 8.550 | 0.001 | 0.011 | 14.306 | 0.012 |
| Line-10                                                          | 46.330 | 28.990 | 5.670 | 7.348  | 2.250 | 10.370 | 8.680 | 0.003 | 0.012 | 4.797  | 0.014 |
| Line-11                                                          |        |        |       | 10.181 | 0.540 | 6.170  | 9.100 | 0.001 | 0.006 | 12.650 | 0.007 |
| Line-12                                                          |        |        |       | 9.370  | 1.820 | 10.100 | 6.240 | 0.002 | 0.009 | 6.294  | 0.011 |

Table 76. Provided are the values of each of the parameters (as described above) measured in Tomato accessions (Line) under normal growth conditions. Growth conditions are specified in the experimental procedure section.

TABLE 77

| Measured parameters in Tomato accessions under salinity conditions |         |       |       |       |       |       |       |        |       |       |       |
|--------------------------------------------------------------------|---------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|
| Line                                                               | Cor. ID |       |       |       |       |       |       |        |       |       |       |
|                                                                    | 2       | 3     | 11    | 12    | 13    | 15    | 27    | 4      | 21    | 17    | 23    |
| Line-1                                                             | 0.540   | 0.640 | 0.150 | 0.120 | 0.360 | 5.600 | 3.560 | 11.400 | 0.001 | 0.000 | 0.001 |
| Line-2                                                             | 0.570   | 0.630 | 0.160 | 0.140 | 0.440 | 6.460 | 3.940 | 11.639 | 0.001 | 0.000 | 0.001 |
| Line-3                                                             | 0.680   | 0.690 | 0.250 | 0.210 | 0.260 | 8.470 | 5.000 |        |       |       |       |
| Line-4                                                             | 0.640   | 0.590 | 0.180 | 0.150 | 0.710 | 8.560 | 4.000 | 10.788 | 0.001 | 0.000 | 0.001 |
| Line-5                                                             | 0.560   | 0.640 | 0.190 | 0.160 | 0.460 | 8.870 | 3.560 | 10.776 | 0.002 | 0.000 | 0.002 |
| Line-6                                                             | 0.680   | 0.670 | 0.170 | 0.160 | 0.540 | 7.560 | 4.390 | 6.952  | 0.001 | 0.000 | 0.001 |
| Line-7                                                             | 0.540   | 0.620 | 0.180 | 0.150 | 0.660 | 8.640 | 3.170 | 9.213  | 0.001 | 0.000 | 0.001 |
| Line-8                                                             | 0.670   | 0.630 | 0.140 | 0.150 | 0.400 | 5.570 | 3.720 | 8.538  | 0.001 | 0.000 | 0.001 |
| Line-9                                                             | 0.650   | 0.720 | 0.140 | 0.120 | 0.520 | 5.820 | 4.000 | 10.370 | 0.001 | 0.000 | 0.001 |
| Line-10                                                            | 0.750   | 0.680 | 0.230 | 0.200 | 0.450 | 9.360 | 4.280 | 8.840  | 0.001 |       |       |
| Line-11                                                            |         |       |       |       |       |       |       | 10.434 | 0.001 | 0.000 | 0.001 |
| Line-12                                                            |         |       |       |       |       |       |       | 12.429 | 0.001 | 0.000 | 0.001 |

Table 77. Provided are the values of each of the parameters (as described above) measured in Tomato accessions (Line) under salinity growth conditions. Growth conditions are specified in the experimental procedure section.

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TABLE 78

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under normal and stress conditions across tomato ecotypes |       |          |          |        |           |       |          |          |        |           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|--------|-----------|-------|----------|----------|--------|-----------|
| Gene Name                                                                                                                                                                                                   | R     | P value  | Cor.     |        | Gene Name | R     | P value  | Cor.     |        | Gene Name |
|                                                                                                                                                                                                             |       |          | Exp. set | Set ID |           |       |          | Exp. set | Set ID |           |
| LNU971                                                                                                                                                                                                      | 0.729 | 4.01E-02 | 4        | 10     | LNU971    | 0.878 | 1.86E-03 | 4        | 9      |           |
| LNU971                                                                                                                                                                                                      | 0.845 | 4.12E-03 | 6        | 21     | LNU971    | 0.786 | 2.07E-02 | 6        | 23     |           |
| LNU971                                                                                                                                                                                                      | 0.736 | 2.38E-02 | 3        | 8      | LNU971    | 0.736 | 2.39E-02 | 8        | 8      |           |
| LNU972                                                                                                                                                                                                      | 0.843 | 4.32E-03 | 6        | 21     | LNU972    | 0.798 | 1.76E-02 | 6        | 23     |           |
| LNU972                                                                                                                                                                                                      | 0.817 | 7.24E-03 | 3        | 8      | LNU973    | 0.808 | 1.52E-02 | 3        | 10     |           |
| LNU973                                                                                                                                                                                                      | 0.716 | 2.99E-02 | 3        | 9      | LNU974    | 0.738 | 3.65E-02 | 1        | 20     |           |
| LNU974                                                                                                                                                                                                      | 0.724 | 2.73E-02 | 4        | 4      | LNU974    | 0.757 | 2.97E-02 | 4        | 1      |           |
| LNU974                                                                                                                                                                                                      | 0.730 | 2.56E-02 | 3        | 8      | LNU974    | 0.715 | 3.05E-02 | 7        | 4      |           |
| LNU974                                                                                                                                                                                                      | 0.737 | 2.34E-02 | 8        | 8      | LNU975    | 0.729 | 2.57E-02 | 9        | 4      |           |
| LNU975                                                                                                                                                                                                      | 0.773 | 1.45E-02 | 4        | 4      | LNU975    | 0.736 | 2.36E-02 | 3        | 8      |           |
| LNU975                                                                                                                                                                                                      | 0.729 | 2.58E-02 | 2        | 4      | LNU975    | 0.839 | 9.17E-03 | 2        | 26     |           |
| LNU975                                                                                                                                                                                                      | 0.778 | 1.36E-02 | 7        | 4      |           |       |          |          |        |           |

Table 78. Provided are the correlations (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector (Corr))] under normal and low nitrogen conditions across tomato ecotypes. P = p value.

## Example 10

### Production of Maize Transcriptom and High Throughput Correlation Analysis when Grown Under Normal and Defoliation Conditions Using 60K Maize Oligonucleotide Micro-Array

To produce a high throughput correlation analysis, the present inventors utilized a Maize oligonucleotide micro-array, produced by Agilent Technologies [chem. (dot) agilent (dot) com/Scripts/PDS (dot) asp?1Page=50879]. The array oligonucleotide represents about 60K Maize genes and transcripts designed based on data from Public databases (Example 1). To define correlations between the levels of RNA expression and yield, biomass components or vigor related parameters, various plant characteristics of 13 different Maize varieties were analyzed under normal conditions and defoliation treatment. Same varieties were subjected to RNA expression analysis. The correlation between the RNA levels and the characterized parameters was ana-

lyzed using Pearson correlation test [davidmlane (dot) com/hyperstat/A34739 (dot) html].

#### Experimental Procedures

13 maize varieties lines were grown in 6 repetitive plots, in field. Maize seeds were planted and plants were grown in the field using commercial fertilization and irrigation protocols. After silking 3 plots in every varieties line underwent the defoliation treatment. In this treatment all the leaves above the ear were removed. After the treatment all the plants were grown according to the same commercial fertilization and irrigation protocols.

Three tissues at flowering developmental (R1) stage including leaf (flowering—R1), stem (flowering—R1), and flowering meristem (flowering—R1) representing different plant characteristics, were sampled from treated and untreated plants. RNA was extracted as described in “GENERAL EXPERIMENTAL AND BIOINFORMATICS METHODS”. For convenience, each micro-array expression information tissue type has received a Set ID as summarized in Tables 79-80 below.

TABLE 79

| Tissues used for Maize transcriptom expression sets<br>(Under normal conditions) |        |
|----------------------------------------------------------------------------------|--------|
| Expression Set                                                                   | Set ID |
| Female meristem/Normal                                                           | 1      |
| leaf/Normal                                                                      | 2      |
| stem/Normal                                                                      | 3      |

Table 79: Provided are the identification (ID) number of each of the Maize expression sets.

TABLE 80

| Tissues used for Maize transcriptom expression sets<br>(Under defoliation conditions) |        |
|---------------------------------------------------------------------------------------|--------|
| Expression Set                                                                        | Set ID |
| Female meristem/Defoliation:                                                          | 1      |
| leaf/Defoliation                                                                      | 2      |
| stem/Defoliation                                                                      | 3      |

Table 80: Provided are the identification (ID) number of each of the Maize expression sets.

The following parameters were collected by imaging.

The image processing system was used, which consists of a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.37, Java based image processing software, which was developed at the U.S. National Institutes of Health and is freely available on the internet at rsbweb (dot) nih (dot) gov/. Images were captured in resolution of 10 Mega Pixels (3888×2592 pixels) and stored in a low compression JPEG (Joint Photographic Experts Group standard) format. Next, image processing output data for seed area and seed length was saved to text files and analyzed using the JMP statistical analysis software (SAS institute).

1000 grain weight—At the end of the experiment all seeds from all plots were collected and weighed and the weight of 1000 was calculated.

Ear Area (cm<sup>2</sup>)—At the end of the growing period 5 ears were, photographed and images were processed using the below described image processing system. The Ear area was measured from those images and was divided by the number of ears.

Ear Length and Ear Width (cm)—At the end of the growing period 6 ears were, photographed and images were processed using the below described image processing system. The Ear length and width (longest axis) was measured from those images and was divided by the number of ears.

Grain Area (cm<sup>2</sup>)—At the end of the growing period the grains were separated from the ear. A sample of ~200 grains were weight, photographed and images were processed using the below described image processing system. The grain area was measured from those images and was divided by the number of grains.

Grain Length and Grain width (cm)—At the end of the growing period the grains were separated from the ear. A sample of ~200 grains were weight, photographed and images were processed using the below described image processing system. The sum of grain lengths/or width (longest axis) was measured from those images and was divided by the number of grains.

Grain Perimeter (cm)—At the end of the growing period the grains were separated from the ear. A sample of ~200 grains were weight, photographed and images were processed using the below described image processing system.

The sum of grain perimeter was measured from those images and was divided by the number of grains.

Ear filled grain area (cm<sup>2</sup>)—At the end of the growing period 5 ears were, photographed and images were processed using the below described image processing system. The Ear area filled with kernels was measured from those images and was divided by the number of Ears.

Filled per Whole Ear—was calculated as the length of the ear with grains out of the total ear.

Additional parameters were collected either by sampling 6 plants per plot or by measuring the parameter across all the plants within the plot.

Cob width [cm]—The diameter of the cob without grains was measured using a ruler.

Ear average weight [kg]—At the end of the experiment (when ears were harvested) total and 6 selected ears per plots were collected. The ears were weighted and the average ear per plant was calculated. The ear weight was normalized using the relative humidity to be 0%.

Plant height and Ear height—Plants were characterized for height at harvesting. In each measure, 6 plants were measured for their height using a measuring tape. Height was measured from ground level to top of the plant below the tassel. Ear height was measured from the ground level to the place where the main ear is located

Ear row num—The number of rows per ear was counted.

Ear fresh weight per plant (GF)—During the grain filling period (GF) and total and 6 selected ears per plot were collected separately. The ears were weighted and the average ear weight per plant was calculated.

Ears dry weight—At the end of the experiment (when ears were harvested) total and 6 selected ears per plots were collected and weighted. The ear weight was normalized using the relative humidity to be 0%.

Ears fresh weight—At the end of the experiment (when ears were harvested) total and 6 selected ears per plots were collected and weighted.

Ears per plant—number of ears per plant were counted.

Grains weight (Kg.)—At the end of the experiment all ears were collected. Ears from 6 plants from each plot were separately threshed and grains were weighted.

Grains dry weight (Kg.)—At the end of the experiment all ears were collected. Ears from 6 plants from each plot were separately threshed and grains were weighted. The grain weight was normalized using the relative humidity to be 0%.

Grain weight per ear (Kg.)—At the end of the experiment all ears were collected. 5 ears from each plot were separately threshed and grains were weighted. The average grain weight per ear was calculated by dividing the total grain weight by the number of ears.

Leaves area per plant (GF) and (HD) [LAI]=Total leaf area of 6 plants in a plot his parameter was measured at two time points during the course of the experiment; at heading (HD) and during the grain filling period (GF). Measurement was performed using a Leaf area-meter at two time points in the course of the experiment; during the grain filling period and at the heading stage (VT).

Leaves fresh weight (GF) and (HD)—This parameter was measured at two time points during the course of the experiment; at heading (HD) and during the grain filling period (GF). Leaves used for measurement of the LAI were weighted.

Lower stem fresh weight (GF) (HD) and (H)—This parameter was measured at three time points during the course of the experiment: at heading (HD), during the grain filling period (GF) and at harvest (H). Lower internodes from at least 4 plants per plot were separated from the plant

and weighted. The average internode weight per plant was calculated by dividing the total grain weight by the number of plants.

Lower stem length (GF) (HD) and (H)—This parameter was measured at three time points during the course of the experiment; at heading (HD), during the grain filling period (GF) and at harvest (H). Lower internodes from at least 4 plants per plot were separated from the plant and their length was measured using a ruler. The average internode length per plant was calculated by dividing the total grain weight by the number of plants.

Lower stem width (GF) (HD) and (H)—This parameter was measured at three time points during the course of the experiment: at heading (HD), during the grain filling period (GF) and at harvest (H). Lower internodes from at least 4 plants per plot were separated from the plant and their diameter was measured using a caliber. The average internode width per plant was calculated by dividing the total grain weight by the number of plants.

Plant height growth: the relative growth rate (RGR) of Plant Height was calculated using Formula III above.

SPAD—Chlorophyll content was determined using a Minolta SPAD 502 chlorophyll meter and measurement was performed 64 days post sowing. SPAD meter readings were done on young fully developed leaf. Three measurements per leaf were taken per plot. Data were taken after 46 and 54 days after sowing (DPS).

Stem fresh weight (GF) and (HD)—This parameter was measured at two time points during the course of the experiment: at heading (HD) and during the grain filling period (GF). Stems of the plants used for measurement of the LAI were weighted.

Total dry matter was calculated using Formula XXXV.

Upper stem fresh weight (GF) (HD) and (H)—This parameter was measured at three time points during the course of the experiment; at heading (HD), during the grain filling period (GF) and at harvest (H). Upper internodes from at least 4 plants per plot were separated from the plant and weighted. The average internode weight per plant was calculated by dividing the total grain weight by the number of plants.

Upper stem length (GF) (HD) and (H)—This parameter was measured at three time points during the course of the experiment; at heading (HD), during the grain filling period (GF) and at harvest (H). Upper internodes from at least 4 plants per plot were separated from the plant and their length was measured using a ruler. The average internode length per plant was calculated by dividing the total grain weight by the number of plants.

Upper stem width (GF) (HD) and (H) (mm)—This parameter was measured at three time points during the course of the experiment; at heading (HD), during the grain filling period (GF) and at harvest (H). Upper internodes from at least 4 plants per plot were separated from the plant and their diameter was measured using a caliber. The average internode width per plant was calculated by dividing the total grain weight by the number of plants.

Vegetative dry weight (Kg.)—total weight of the vegetative portion of 6 plants (above ground excluding roots) after drying at 70° C. in oven for 48 hours weight by the number of plants.

Vegetative fresh weight (Kg.)—total weight of the vegetative portion of 6 plants (above ground excluding roots).

Node number—nodes on the stem were counted at the heading stage of plant development.

TABLE 81

| Maize correlated parameters (vectors) under normal conditions and under defoliation |                |                                          |    |
|-------------------------------------------------------------------------------------|----------------|------------------------------------------|----|
| Normal conditions                                                                   |                | Defoliation                              |    |
| Correlated parameter with                                                           | Correlation ID | Correlated parameter with                | ID |
| 1000 grains weight [g]                                                              | 1              | 1000 grains weight [g]                   | 1  |
| Cob width [mm]                                                                      | 2              | Cob width [mm]                           | 2  |
| Ear Area [cm <sup>2</sup> ]                                                         | 3              | Ear Area [cm <sup>2</sup> ]              | 3  |
| Ear Filled Grain Area [cm <sup>2</sup> ]                                            | 4              | Ear Filled Grain Area [cm <sup>2</sup> ] | 4  |
| Ear Width [cm]                                                                      | 5              | Ear Width [cm]                           | 5  |
| Ear avr weight [g]                                                                  | 6              | Ear avr weight [g]                       | 6  |
| Ear height [cm]                                                                     | 7              | Ear height [cm]                          | 7  |
| Ear length (feret's) [cm]                                                           | 8              | Ear length (feret's) [cm]                | 8  |
| Ear row num                                                                         | 9              | Ear row num                              | 9  |
| Ears FW per plant (GF) [g/plant]                                                    | 10             | Ears dry weight (SP) [g/plant]           | 10 |
| Ears dry weight (SP) [kg]                                                           | 11             | Ears fresh weight (SP) [kg]              | 11 |
| Ears fresh weight (SP) [kg]                                                         | 12             | Ears per plant (SP) [g/plant]            | 12 |
| Ears per plant (SP) [g/plant]                                                       | 13             | Filled/Whole Ear [value]                 | 13 |
| Filled/Whole Ear [value]                                                            | 14             | Grain Perimeter [cm]                     | 14 |
| Grain Perimeter [cm]                                                                | 15             | Grain RH [%]                             | 15 |
| Grain RH [%]                                                                        | 16             | Grain area [cm <sup>2</sup> ]            | 16 |
| Grain area [cm <sup>2</sup> ]                                                       | 17             | Grain length [cm]                        | 17 |
| Grain length [cm]                                                                   | 18             | Grain width [cm]                         | 18 |
| Grain width [cm]                                                                    | 19             | Grains dry weight (SP) [kg]              | 19 |
| Grains dry weight (SP) [kg]                                                         | 20             | Grains weight (SP) [kg]                  | 20 |
| Grains weight (SP) [kg]                                                             | 21             | Grains weight per ear (SP) [kg]          | 21 |
| Grains weight per ear (SP) [kg]                                                     | 22             | Leaves FW (hd) [g]                       | 22 |
| Leaves FW (GF) [g]                                                                  | 23             | Leaves area PP (hd) [cm <sup>2</sup> ]   | 23 |
| Leaves FW (hd) [g]                                                                  | 24             | Leaves num (LAI) (hd)                    | 24 |
| Leaves area PP (GF) [cm <sup>2</sup> ]                                              | 25             | Leaves num 1                             | 25 |
| Leaves area PP (hd) [cm <sup>2</sup> ]                                              | 26             | Leaves temperature (GF)                  | 26 |
| Leaves num (LAI) (hd)                                                               | 27             | Lower Stem FW (h) [g]                    | 27 |
| Leaves num 1                                                                        | 28             | Lower Stem FW (hd) [g]                   | 28 |
| Leaves temperature (GF)                                                             | 29             | Lower Stem length (h) [cm]               | 29 |
| Lower Stem FW (GF) [g]                                                              | 30             | Lower Stem length (hd) [cm]              | 30 |
| Lower Stem FW (h) [g]                                                               | 31             | Lower Stem width (h) [mm]                | 31 |

TABLE 81-continued

| Maize correlated parameters (vectors) under normal conditions and under defoliation |                |                              |             |
|-------------------------------------------------------------------------------------|----------------|------------------------------|-------------|
| Normal conditions                                                                   |                | Defoliation                  | Correlation |
| Correlated parameter with                                                           | Correlation ID | Correlated parameter with    | ID          |
| Lower Stem FW (hd) [g]                                                              | 32             | Lower Stem width (hd) [mm]   | 32          |
| Lower Stem length (GF) [cm]                                                         | 33             | Node number                  | 33          |
| Lower Stem length (h) [cm]                                                          | 34             | Num days to Heading (field)  | 34          |
| Lower Stem length (hd) [cm]                                                         | 35             | Plant height [cm]            | 35          |
| Lower Stem width (GF) [cm]                                                          | 36             | Plant height growth [cm/day] | 36          |
| Lower Stem width (h) [mm]                                                           | 37             | SPAD (GF) [value]            | 37          |
| Lower Stem width (hd) [mm]                                                          | 38             | Stem FW (hd) [mm]            | 38          |
| Node number                                                                         | 39             | Total dry matter (SP) [kg]   | 39          |
| Num days to Heading (field)                                                         | 40             | Upper Stem FW (h) [g]        | 40          |
| Plant height [cm]                                                                   | 41             | Upper Stem length (h) [cm]   | 41          |
| Plant height growth [cm/day]                                                        | 42             | Upper Stem width (h) [mm]    | 42          |
| SPAD (GF) [value]                                                                   | 43             | Vegetative DW (SP) [kg]      | 43          |
| Stem FW (GF) [g]                                                                    | 44             | Vegetative FW (SP) [kg]      | 44          |
| Stem FW (hd) [g]                                                                    | 45             |                              |             |
| Total dry matter (SP) [kg]                                                          | 46             |                              |             |
| Upper Stem FW (GF) [g]                                                              | 47             |                              |             |
| Upper Stem FW (h) [g]                                                               | 48             |                              |             |
| Upper Stem length (GF) [cm]                                                         | 49             |                              |             |
| Upper Stem length (h) [cm]                                                          | 50             |                              |             |
| Upper Stem width (GF) [mm]                                                          | 51             |                              |             |
| Upper Stem width (h) [mm]                                                           | 52             |                              |             |
| Vegetative DW (SP) [kg]                                                             | 53             |                              |             |
| Vegetative FW (SP) [kg]                                                             | 54             |                              |             |

Table 81. Provided are the maize correlated parameters,.

"NUE" = nitrogen use efficiency;

"DW" = dry weight;

"cm" = centimeter;

"GF" = grain filling;

"PP" = per plant;

"h" = harvest;

"avr" = average;

"NUM" = number.

"mm" = millimeter;

"g" = grams;

"kg" = kilograms;

"cm" = centimeter.

Thirteen maize varieties were grown, and characterized for parameters, as described above. The average for each parameter was calculated using the JMP software, and values are summarized in Tables 82-85 below. Subsequent

correlation between the various transcriptom sets for all or sub set of lines was done by the bioinformatic unit and results were integrated into the database (Tables 86-87 below).

TABLE 82

| Measured parameters in Maize varieties under normal conditions |         |         |         |         |         |         |
|----------------------------------------------------------------|---------|---------|---------|---------|---------|---------|
| Ecotype/Treatment                                              | Line-1  | Line-2  | Line-3  | Line-4  | Line-5  | Line-6  |
| 1                                                              | 241.091 | 296.503 | 232.402 | 263.250 | 305.376 | 303.614 |
| 2                                                              | 23.427  | 24.633  | 22.149  | 25.106  | 24.714  | 23.207  |
| 3                                                              | 47.516  | 82.296  | 36.009  | 74.626  | 61.731  | 76.997  |
| 4                                                              | 46.808  | 80.887  | 17.431  | 72.415  | 56.829  | 73.430  |
| 5                                                              | 4.249   | 4.656   | 3.210   | 4.787   | 5.016   | 4.961   |
| 6                                                              | 22.854  | 209.500 | 55.556  | 164.627 | 132.917 | 177.444 |
| 7                                                              | 71.139  | 121.667 | 110.611 | 134.235 | 89.333  | 149.639 |
| 8                                                              | 13.937  | 22.091  | 13.897  | 19.622  | 16.062  | 20.024  |
| 9                                                              | 11.778  | 13.000  | 13.750  | 14.944  | 15.471  | 14.556  |
| 10                                                             | 228.743 | 351.262 | 201.689 | 323.077 | 217.161 | 307.874 |
| 11                                                             | 0.615   | 1.257   | 0.333   | 1.087   | 0.798   | 1.065   |
| 12                                                             | 0.688   | 1.687   | 0.468   | 1.457   | 1.072   | 1.412   |
| 13                                                             | 1.667   | 1.000   | 1.000   | 1.111   | 1.000   | 1.000   |
| 14                                                             | 0.985   | 0.982   | 0.406   | 0.969   | 0.919   | 0.953   |
| 15                                                             | 3.146   | 3.299   | 2.793   | 3.233   | 3.318   | 3.275   |
| 16                                                             | 12.700  | 12.500  | 12.367  | 12.367  | 12.233  | 11.967  |
| 17                                                             | 0.652   | 0.720   | 0.517   | 0.667   | 0.705   | 0.706   |
| 18                                                             | 1.058   | 1.125   | 0.895   | 1.123   | 1.155   | 1.133   |
| 19                                                             | 0.783   | 0.808   | 0.734   | 0.753   | 0.776   | 0.789   |
| 20                                                             | 0.415   | 0.907   | 0.121   | 0.800   | 0.367   | 0.766   |
| 21                                                             | 0.475   | 1.037   | 0.138   | 0.913   | 0.418   | 0.869   |
| 22                                                             | 0.069   | 0.151   | 0.020   | 0.133   | 0.061   | 0.128   |

TABLE 82-continued

| Measured parameters in Maize varieties under normal conditions |          |          |          |          |          |          |
|----------------------------------------------------------------|----------|----------|----------|----------|----------|----------|
| Ecotype/Treatment                                              | Line-1   | Line-2   | Line-3   | Line-4   | Line-5   | Line-6   |
| 23                                                             | 137.328  | 230.129  | 141.263  | 197.636  | 154.760  | 201.031  |
| 24                                                             | 96.392   | 110.968  | 103.967  | 80.570   | 119.360  | 157.210  |
| 25                                                             | 4186.917 | 7034.596 | 4884.333 | 6402.795 | 4297.250 | 6353.074 |
| 26                                                             | 4341.250 | 3171.000 | 4347.500 | 3527.000 | 4517.333 | 3984.750 |
| 27                                                             | 9.000    | 8.000    | 8.833    | 6.750    | 8.500    | 7.750    |
| 28                                                             | 4.333    | 4.833    | 3.917    | 4.167    | 4.000    | 4.833    |
| 29                                                             | 32.294   | 33.111   | 35.214   | 33.517   | 34.526   | 33.869   |
| 30                                                             | 29.703   | 35.403   | 15.660   | 25.025   | 23.986   | 26.514   |
| 31                                                             | 33.690   | 23.517   | 21.746   | 20.340   | 23.466   | 25.083   |
| 32                                                             | 38.818   | 72.988   | 36.998   | 59.900   | 32.614   | 74.715   |
| 33                                                             | 13.417   | 19.350   | 15.833   | 20.400   | 16.342   | 20.925   |
| 34                                                             | 12.484   | 16.761   | 16.094   | 20.022   | 15.006   | 22.594   |
| 35                                                             | 9.417    | 14.500   | 14.133   | 17.750   | 11.083   | 20.000   |
| 36                                                             | 20.208   | 19.855   | 15.904   | 16.841   | 15.593   | 16.139   |
| 37                                                             | 21.518   | 19.423   | 15.819   | 17.188   | 17.028   | 16.086   |
| 38                                                             | 23.494   | 24.138   | 20.247   | 20.533   | 20.812   | 20.973   |
| 39                                                             | 14.667   | 15.222   | 13.778   | 14.556   | 13.667   | 14.611   |
| 40                                                             | 74.000   | 69.667   | 74.000   | 71.000   | 74.000   | 69.667   |
| 41                                                             | 173.389  | 265.111  | 203.556  | 255.944  | 177.444  | 271.111  |
| 42                                                             | 4.030    | 6.302    | 4.153    | 6.519    | 4.358    | 7.144    |
| 43                                                             | 60.952   | 59.772   | 48.589   | 53.170   | 57.919   | 53.206   |
| 44                                                             | 447.155  | 649.026  | 347.648  | 489.318  | 404.783  | 524.055  |
| 45                                                             | 468.300  | 758.610  | 392.713  | 587.875  | 437.855  | 801.320  |
| 46                                                             | 1.615    | 2.565    | 1.411    | 2.058    | 1.835    | 2.316    |
| 47                                                             | 14.369   | 19.614   | 8.862    | 15.539   | 13.003   | 17.824   |
| 48                                                             | 10.441   | 12.937   | 8.003    | 11.212   | 10.438   | 12.975   |
| 49                                                             | 11.792   | 16.633   | 13.917   | 18.755   | 13.217   | 18.375   |
| 50                                                             | 10.422   | 16.928   | 13.683   | 18.756   | 12.306   | 18.717   |

Table 82.

TABLE 83

| Measured parameters in Maize varieties under normal conditions, additional maize lines |          |          |          |          |          |          |          |
|----------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|
| Ecotype/<br>Treatment                                                                  | Line-14  | Line-15  | Line-16  | Line-17  | Line-18  | Line-19  | Line-20  |
| 1                                                                                      | 290.881  | 202.573  | 250.257  | 275.409  | 306.201  | 256.858  | 187.316  |
| 2                                                                                      | 23.184   | 25.919   | 24.876   | 22.751   | 26.468   | 21.662   | 24.046   |
| 3                                                                                      | 78.355   | 51.175   | 93.914   | 57.832   | 96.772   | 64.428   | 55.077   |
| 4                                                                                      | 74.411   | 45.927   | 92.312   | 54.139   | 95.429   | 61.811   | 51.437   |
| 5                                                                                      | 4.786    | 4.368    | 5.182    | 4.430    | 5.001    | 4.091    | 4.264    |
| 6                                                                                      | 147.490  | 101.917  | 207.111  | 100.476  | 228.444  | 129.889  | 84.805   |
| 7                                                                                      | 118.389  | 117.889  | 145.235  | 99.222   | 133.778  | 81.444   | 125.000  |
| 8                                                                                      | 20.313   | 14.750   | 22.601   | 16.653   | 23.837   | 19.849   | 16.955   |
| 9                                                                                      | 16.118   | 15.944   | 15.889   | 13.545   | 14.000   | 12.667   | 17.941   |
| 10                                                                                     | 325.083  | 244.997  | 327.145  | 241.060  | 363.704  | 262.126  | 146.149  |
| 11                                                                                     | 1.159    | 0.612    | 1.292    | 0.632    | 1.371    | 0.779    | 0.690    |
| 12                                                                                     | 1.800    | 0.704    | 1.595    | 0.865    | 1.739    | 1.213    | 0.861    |
| 13                                                                                     | 1.000    | 1.000    | 1.056    | 1.056    | 1.000    | 1.000    | 0.944    |
| 14                                                                                     | 0.930    | 0.889    | 0.982    | 0.934    | 0.986    | 0.955    | 0.934    |
| 15                                                                                     | 3.246    | 2.860    | 3.182    | 3.082    | 3.291    | 2.946    | 2.810    |
| 16                                                                                     | 12.600   | 12.033   | 12.233   | 11.200   | 11.967   | 13.133   | 11.667   |
| 17                                                                                     | 0.665    | 0.526    | 0.646    | 0.627    | 0.705    | 0.587    | 0.495    |
| 18                                                                                     | 1.142    | 0.992    | 1.118    | 1.041    | 1.151    | 0.969    | 0.962    |
| 19                                                                                     | 0.740    | 0.672    | 0.730    | 0.763    | 0.774    | 0.767    | 0.653    |
| 20                                                                                     | 0.820    | 0.362    | 0.921    | 0.419    | 1.017    | 0.516    | 0.408    |
| 21                                                                                     | 0.940    | 0.411    | 1.050    | 0.471    | 1.155    | 0.595    | 0.462    |
| 22                                                                                     | 0.137    | 0.064    | 0.154    | 0.073    | 0.169    | 0.086    | 0.073    |
| 23                                                                                     | 212.413  | 137.330  | 181.432  | 133.844  | 199.221  | 155.821  | 140.336  |
| 24                                                                                     | 116.750  | 96.150   | 106.945  | 107.158  | 85.973   | 98.842   | 134.450  |
| 25                                                                                     | 7123.475 | 4162.750 | 6075.206 | 4339.788 | 6597.666 | 4756.583 | 4209.091 |
| 26                                                                                     |          |          |          |          |          | 4205.500 |          |
| 27                                                                                     | 7.000    | 8.667    | 7.250    | 7.833    | 7.250    | 9.000    | 9.833    |
| 28                                                                                     | 4.250    | 3.833    | 4.833    | 3.333    | 4.083    | 3.833    | 4.167    |
| 29                                                                                     | 33.185   | 34.815   | 33.659   | 36.480   | 33.781   | 34.431   | 34.898   |
| 30                                                                                     | 27.606   | 24.589   | 25.264   | 24.006   | 26.178   | 21.142   | 29.925   |
| 31                                                                                     | 20.603   | 15.197   | 16.347   | 19.856   | 18.901   | 22.333   | 31.712   |
| 32                                                                                     | 60.358   | 50.068   | 63.067   | 46.065   | 55.885   | 29.802   | 68.184   |
| 33                                                                                     | 18.083   | 17.700   | 20.182   | 15.475   | 19.808   | 16.042   | 23.075   |
| 34                                                                                     | 17.072   | 18.267   | 20.694   | 14.622   | 18.478   | 16.206   | 21.117   |
| 35                                                                                     | 15.000   | 12.333   | 18.675   | 14.633   | 20.500   | 11.240   | 18.333   |
| 36                                                                                     | 18.105   | 16.705   | 17.094   | 15.435   | 16.868   | 15.521   | 14.653   |

TABLE 83-continued

| Measured parameters in Maize varieties under normal conditions, additional maize lines |         |         |         |         |         |         |         |
|----------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| Ecotype/<br>Treatment                                                                  | Line-14 | Line-15 | Line-16 | Line-17 | Line-18 | Line-19 | Line-20 |
| 37                                                                                     | 17.962  | 15.953  | 18.421  | 16.266  | 17.434  | 15.489  | 16.656  |
| 38                                                                                     | 23.473  | 21.292  | 20.973  | 20.593  | 21.458  | 18.966  | 22.008  |
| 39                                                                                     | 14.278  | 13.889  | 14.722  | 14.444  | 15.444  | 12.556  | 13.389  |
| 40                                                                                     | 72.000  | 74.000  | 69.667  | 74.000  | 71.000  | 74.000  | 68.333  |
| 41                                                                                     | 244.250 | 215.206 | 273.556 | 229.889 | 273.222 | 194.056 | 260.167 |
| 42                                                                                     | 5.603   | 4.686   | 6.960   | 4.424   | 7.017   | 4.298   | 6.424   |
| 43                                                                                     | 55.376  | 56.450  | 56.759  | 54.600  | 55.812  | 52.548  | 61.457  |
| 44                                                                                     | 507.783 | 475.345 | 549.336 | 463.157 | 509.738 | 324.976 | 477.917 |
| 45                                                                                     | 660.695 | 468.267 | 724.575 | 435.500 | 618.460 | 339.267 | 592.130 |
| 46                                                                                     | 2.233   | 1.347   | 2.727   | 1.503   | 2.331   | 1.560   | 1.615   |
| 47                                                                                     | 15.849  | 12.442  | 14.395  | 16.773  | 17.848  | 13.457  | 20.847  |
| 48                                                                                     | 9.723   | 3.074   | 6.981   | 9.759   | 9.396   | 11.344  | 16.205  |
| 49                                                                                     | 17.067  | 14.467  | 17.518  | 17.542  | 18.150  | 15.625  | 20.150  |
| 50                                                                                     | 16.417  | 12.094  | 18.339  | 15.622  | 16.628  | 16.572  | 18.494  |

Table 83.

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TABLE 84

| Measured parameters in Maize varieties under defoliation |          |         |          |         |          |         |
|----------------------------------------------------------|----------|---------|----------|---------|----------|---------|
| Ecotype/Treatment                                        | Line-2   | Line-3  | Line-4   | Line-5  | Line-6   | Line-7  |
| 1                                                        | 280.025  | 249.808 | 251.859  | 244.024 | 294.292  | 262.463 |
| 2                                                        | 19.028   | 21.874  | 22.115   | 19.269  | 16.306   | 21.460  |
| 3                                                        | 53.600   | NA      | 45.503   | 25.764  | 38.307   | 37.749  |
| 4                                                        | 51.497   | NA      | 42.952   | 21.912  | 34.591   | 36.008  |
| 5                                                        | 4.181    | NA      | 4.207    | 3.376   | 3.919    | 3.945   |
| 6                                                        | 89.202   | 56.056  | 100.750  | 26.773  | 73.389   | 79.167  |
| 7                                                        | 119.444  | 102.778 | 131.556  | 91.375  | 145.528  | 121.000 |
| 8                                                        | 16.338   | NA      | 13.626   | 10.542  | 12.889   | 12.481  |
| 9                                                        | 12.706   | 13.909  | 14.357   | 13.600  | 13.000   | 13.167  |
| 10                                                       | 0.747    | 0.317   | 0.583    | 0.189   | 0.440    | 0.475   |
| 11                                                       | 0.973    | 0.464   | 0.833    | 0.250   | 0.629    | 0.637   |
| 12                                                       | 1.000    | 0.944   | 0.944    | 0.471   | 1.000    | 1.000   |
| 13                                                       | 0.954    | NA      | 0.915    | 0.820   | 0.873    | 0.951   |
| 14                                                       | 3.109    | 2.936   | 3.144    | 2.894   | 3.179    | 2.919   |
| 15                                                       | 13.467   | 12.767  | 12.367   | 13.200  | 12.833   | 12.400  |
| 16                                                       | 0.649    | 0.562   | 0.632    | 0.563   | 0.669    | 0.570   |
| 17                                                       | 1.052    | 0.947   | 1.080    | 0.957   | 1.079    | 0.956   |
| 18                                                       | 0.777    | 0.753   | 0.740    | 0.729   | 0.781    | 0.757   |
| 19                                                       | 0.523    | 0.155   | 0.400    | 0.087   | 0.289    | 0.283   |
| 20                                                       | 0.604    | 0.178   | 0.456    | 0.097   | 0.331    | 0.323   |
| 21                                                       | 0.087    | 0.027   | 0.069    | 0.021   | 0.048    | 0.047   |
| 22                                                       | 112.270  | 78.475  | 94.985   | 107.475 | 125.138  | 93.500  |
| 23                                                       | 3914.000 | NA      | 3480.000 | NA      | 4276.500 | NA      |
| 24                                                       | 7.750    | 8.000   | 7.500    | 8.667   | 8.000    | 8.167   |
| 25                                                       | 4.500    | 3.917   | 4.083    | 4.917   | 4.333    | 4.583   |
| 26                                                       | 32.472   | 34.626  | 33.093   | 34.456  | 33.637   | 32.433  |
| 27                                                       | 23.021   | 18.392  | 26.502   | 19.689  | 26.975   | 14.456  |
| 28                                                       | 64.160   | 30.778  | 53.813   | 28.248  | 56.413   | 47.118  |
| 29                                                       | 16.294   | 15.306  | 21.439   | 14.294  | 20.850   | 14.056  |
| 30                                                       | 15.150   | 12.250  | 18.500   | 9.133   | 16.667   | 14.917  |
| 31                                                       | 19.539   | 15.813  | 16.899   | 15.916  | 15.793   | 15.517  |
| 32                                                       | 24.300   | 18.868  | 20.565   | 21.737  | 21.058   | 22.490  |
| 33                                                       | 15.167   | 13.167  | 14.389   | 13.294  | 15.000   | 13.833  |
| 34                                                       | 72.000   | 78.000  | 73.000   | 74.000  | 73.000   | 74.000  |
| 35                                                       | 251.417  | 191.000 | 248.639  | 175.500 | 268.056  | 203.444 |
| 36                                                       | 6.385    | 3.787   | 6.319    | 4.232   | 6.315    | 4.214   |
| 37                                                       | 61.213   | 47.106  | 57.363   | 55.451  | 58.022   | 58.156  |
| 38                                                       | 713.540  | 323.125 | 538.043  | 442.733 | 705.525  | 421.642 |

Table 84.

TABLE 85

| Measured parameters in Maize varieties under defoliation, additional maize lines |          |         |          |         |          |         |         |
|----------------------------------------------------------------------------------|----------|---------|----------|---------|----------|---------|---------|
| Ecotype/<br>Treatment                                                            | Line-14  | Line-15 | Line-16  | Line-17 | Line-18  | Line-19 | Line-20 |
| 1                                                                                | 230.119  | 200.087 | 271.250  | 236.886 | 259.427  | 218.764 | 203.643 |
| 2                                                                                | 19.768   | 23.640  | 22.441   | 20.880  | 20.283   | 20.871  | 21.198  |
| 3                                                                                | 39.827   | 32.330  | 47.329   | 21.782  | 65.896   | 37.337  | 63.114  |
| 4                                                                                | 36.313   | 25.193  | 43.339   | 20.167  | 64.803   | 34.644  | 54.962  |
| 5                                                                                | 4.099    | 3.520   | 4.202    | 2.743   | 4.664    | 3.532   | 4.562   |
| 6                                                                                | 85.044   | 53.044  | 33.100   | 92.167  | 161.761  | 66.500  | 89.497  |
| 7                                                                                | 123.375  | 112.722 | 135.000  | 96.000  | 136.500  | 73.500  | 113.944 |
| 8                                                                                | 13.214   | 11.957  | 14.818   | 10.472  | 17.602   | 13.734  | 17.210  |
| 9                                                                                | 14.063   | 15.125  | 13.750   | 12.333  | 13.938   | 12.471  | 18.000  |
| 10                                                                               | 0.454    | 0.300   | 0.630    | 0.128   | 0.803    | 0.399   | 0.478   |
| 11                                                                               | 0.648    | 0.371   | 0.819    | 0.136   | 1.148    | 0.739   | 0.599   |
| 12                                                                               | 0.889    | 0.944   | 1.000    | 0.222   | 0.882    | 1.000   | 0.944   |
| 13                                                                               | 0.905    | 0.709   | 0.905    | 0.933   | 0.983    | 0.918   | 0.757   |
| 14                                                                               | 3.130    | 2.558   | 3.016    | 2.810   | 3.117    | 2.767   | 2.934   |
| 15                                                                               | 12.567   | 13.000  | 13.150   | 12.800  | 13.150   | 12.967  | 11.700  |
| 16                                                                               | 0.631    | 0.442   | 0.610    | 0.528   | 0.623    | 0.513   | 0.543   |
| 17                                                                               | 1.066    | 0.826   | 1.024    | 0.932   | 1.084    | 0.927   | 1.020   |
| 18                                                                               | 0.750    | 0.672   | 0.750    | 0.716   | 0.724    | 0.699   | 0.670   |
| 19                                                                               | 0.302    | 0.143   | 0.439    | 0.044   | 0.667    | 0.255   | 0.359   |
| 20                                                                               | 0.345    | 0.165   | 0.505    | 0.050   | 0.767    | 0.293   | 0.406   |
| 21                                                                               | 0.056    | 0.025   | 0.073    | 0.026   | 0.124    | 0.043   | 0.076   |
| 22                                                                               | 113.783  | 93.190  | 93.738   | 94.367  | 89.858   | 91.600  | 122.070 |
| 23                                                                               | 3436.000 | NA      | 4593.000 | NA      | 4315.500 | NA      | NA      |
| 24                                                                               | 6.750    | 8.800   | 7.500    | 7.833   | 6.250    | 8.500   | 9.400   |
| 25                                                                               | 4.417    | 4.667   | 4.500    | 4.000   | 4.083    | 4.333   | 4.167   |
| 26                                                                               | 33.433   | 32.831  | 33.424   | 33.020  | 33.981   | 31.871  | 33.320  |
| 27                                                                               | 27.885   | 17.561  | 17.329   | 17.691  | 20.510   | 23.057  | 34.332  |
| 28                                                                               | 64.188   | 48.835  | 76.233   | 45.857  | 57.850   | 27.597  | 59.030  |
| 29                                                                               | 18.759   | 17.972  | 20.883   | 13.228  | 17.828   | 14.911  | 20.122  |
| 30                                                                               | 16.100   | 12.917  | 14.833   | 12.917  | 17.500   | 10.667  | 17.200  |
| 31                                                                               | 18.215   | 17.289  | 17.233   | 16.176  | 17.882   | 15.890  | 18.708  |
| 32                                                                               | 20.955   | 22.352  | 22.470   | 20.057  | 21.230   | 18.472  | 20.590  |
| 33                                                                               | 14.389   | 13.667  | 14.667   | 14.222  | 15.611   | 12.333  | 13.111  |
| 34                                                                               | 71.000   | 74.000  | 70.667   | 74.000  | 71.000   | 75.333  | 72.000  |
| 35                                                                               | 254.639  | 210.222 | 261.944  | 215.889 | 268.878  | 181.722 | 251.000 |
| 36                                                                               | 6.482    | 4.912   | 6.282    | 4.450   | 7.044    | 3.711   | 5.808   |
| 37                                                                               | 59.654   | 58.322  | 59.985   | 54.907  | 56.761   | 50.606  | 60.657  |
| 38                                                                               | 673.238  | 485.700 | 738.368  | 392.267 | 692.225  | 327.840 | 539.167 |

Table 85.

Tables 86 and 87 here in below provide the correlations<sup>40</sup> (R) between the expression levels yield improving genes and their homologs in various tissues [Expression (Exp) sets] and the phenotypic performance [yield, biomass, growth rate and/or vigor components (Correlation vector (Cor))] under normal and defoliation conditions across maize varieties.<sup>45</sup> P=p value.

TABLE 86

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under normal conditions across maize varieties |       |          |          |             |           |       |          |          |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                        | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU814                                                                                                                                                                                           | 0.711 | 1.41E-02 | 3        | 26          | LNU824    | 0.727 | 3.85E-05 | 3        | 50          |
| LNU824                                                                                                                                                                                           | 0.843 | 1.24E-07 | 3        | 12          | LNU824    | 0.720 | 4.95E-05 | 3        | 6           |
| LNU824                                                                                                                                                                                           | 0.770 | 6.81E-06 | 3        | 20          | LNU824    | 0.779 | 4.47E-06 | 3        | 11          |
| LNU824                                                                                                                                                                                           | 0.775 | 5.45E-06 | 3        | 21          | LNU824    | 0.752 | 1.44E-05 | 3        | 25          |
| LNU824                                                                                                                                                                                           | 0.701 | 9.54E-05 | 3        | 10          | LNU824    | 0.754 | 1.34E-05 | 3        | 22          |
| LNU824                                                                                                                                                                                           | 0.776 | 1.35E-05 | 2        | 50          | LNU824    | 0.704 | 1.76E-04 | 2        | 23          |
| LNU824                                                                                                                                                                                           | 0.743 | 4.96E-05 | 2        | 12          | LNU824    | 0.708 | 1.56E-04 | 2        | 11          |
| LNU832                                                                                                                                                                                           | 0.766 | 1.60E-02 | 2        | 26          | LNU813    | 0.722 | 1.21E-02 | 2        | 49          |
| LNU813                                                                                                                                                                                           | 0.738 | 6.14E-03 | 3        | 13          | LNU814    | 0.700 | 1.12E-02 | 3        | 32          |
| LNU813                                                                                                                                                                                           | 0.719 | 1.26E-02 | 2        | 48          | LNU815    | 0.835 | 7.34E-04 | 1        | 36          |
| LNU814                                                                                                                                                                                           | 0.729 | 1.10E-02 | 1        | 5           | LNU815    | 0.732 | 6.85E-03 | 1        | 19          |
| LNU815                                                                                                                                                                                           | 0.705 | 1.05E-02 | 1        | 1           | LNU816    | 0.703 | 1.57E-02 | 2        | 7           |
| LNU815                                                                                                                                                                                           | 0.753 | 4.68E-03 | 1        | 30          | LNU817    | 0.840 | 1.21E-03 | 2        | 38          |

TABLE 86-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under normal conditions across maize varieties |       |          |          |             |           |       |          |          |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                        | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU816                                                                                                                                                                                           | 0.722 | 7.99E-03 | 1        | 13          | LNU818    | 0.834 | 7.40E-04 | 3        | 37          |
| LNU818                                                                                                                                                                                           | 0.731 | 6.92E-03 | 3        | 28          | LNU818    | 0.737 | 9.61E-03 | 2        | 41          |
| LNU818                                                                                                                                                                                           | 0.794 | 2.02E-03 | 3        | 7           | LNU818    | 0.770 | 5.60E-03 | 2        | 34          |
| LNU818                                                                                                                                                                                           | 0.700 | 1.64E-02 | 2        | 51          | LNU818    | 0.749 | 8.04E-03 | 1        | 5           |
| LNU818                                                                                                                                                                                           | 0.829 | 1.60E-03 | 2        | 7           | LNU819    | 0.712 | 1.40E-02 | 2        | 40          |
| LNU819                                                                                                                                                                                           | 0.764 | 6.20E-03 | 3        | 5           | LNU820    | 0.755 | 4.57E-03 | 3        | 18          |
| LNU819                                                                                                                                                                                           | 0.713 | 1.37E-02 | 1        | 5           | LNU820    | 0.834 | 7.46E-04 | 3        | 32          |
| LNU820                                                                                                                                                                                           | 0.794 | 2.05E-03 | 3        | 46          | LNU820    | 0.704 | 1.07E-02 | 3        | 21          |
| LNU820                                                                                                                                                                                           | 0.712 | 9.44E-03 | 3        | 20          | LNU820    | 0.759 | 4.22E-03 | 1        | 36          |
| LNU820                                                                                                                                                                                           | 0.712 | 9.44E-03 | 3        | 22          | LNU821    | 0.715 | 8.92E-03 | 3        | 51          |
| LNU820                                                                                                                                                                                           | 0.736 | 6.32E-03 | 1        | 19          | LNU823    | 0.780 | 2.76E-03 | 3        | 34          |
| LNU823                                                                                                                                                                                           | 0.766 | 3.65E-03 | 3        | 51          | LNU823    | 0.757 | 4.38E-03 | 3        | 42          |
| LNU823                                                                                                                                                                                           | 0.741 | 5.79E-03 | 3        | 33          | LNU823    | 0.726 | 7.47E-03 | 3        | 35          |
| LNU823                                                                                                                                                                                           | 0.776 | 3.03E-03 | 3        | 43          | LNU823    | 0.753 | 1.19E-02 | 2        | 8           |
| LNU823                                                                                                                                                                                           | 0.744 | 8.61E-03 | 2        | 51          | LNU825    | 0.745 | 5.38E-03 | 3        | 19          |
| LNU824                                                                                                                                                                                           | 0.705 | 1.05E-02 | 3        | 13          | LNU828    | 0.726 | 7.57E-03 | 3        | 34          |
| LNU825                                                                                                                                                                                           | 0.704 | 1.56E-02 | 2        | 1           | LNU828    | 0.719 | 8.47E-03 | 1        | 49          |
| LNU828                                                                                                                                                                                           | 0.804 | 1.62E-03 | 3        | 33          | LNU828    | 0.726 | 7.53E-03 | 1        | 48          |
| LNU828                                                                                                                                                                                           | 0.789 | 2.31E-03 | 1        | 45          | LNU829    | 0.713 | 9.30E-03 | 3        | 19          |
| LNU828                                                                                                                                                                                           | 0.823 | 1.02E-03 | 1        | 30          | LNU831    | 0.865 | 2.82E-04 | 1        | 36          |
| LNU831                                                                                                                                                                                           | 0.746 | 5.30E-03 | 3        | 44          | LNU834    | 0.730 | 6.97E-03 | 1        | 24          |
| LNU831                                                                                                                                                                                           | 0.777 | 2.96E-03 | 1        | 53          | LNU834    | 0.805 | 1.57E-03 | 1        | 34          |
| LNU834                                                                                                                                                                                           | 0.751 | 7.71E-03 | 1        | 5           | LNU834    | 0.702 | 1.09E-02 | 1        | 46          |
| LNU834                                                                                                                                                                                           | 0.723 | 7.92E-03 | 1        | 18          | LNU834    | 0.767 | 3.57E-03 | 1        | 20          |
| LNU834                                                                                                                                                                                           | 0.829 | 8.51E-04 | 1        | 32          | LNU834    | 0.751 | 4.89E-03 | 1        | 11          |
| LNU834                                                                                                                                                                                           | 0.723 | 7.86E-03 | 1        | 7           | LNU834    | 0.767 | 3.57E-03 | 1        | 22          |
| LNU834                                                                                                                                                                                           | 0.758 | 4.28E-03 | 1        | 21          | LNU835    | 0.876 | 1.86E-04 | 1        | 49          |
| LNU835                                                                                                                                                                                           | 0.725 | 1.15E-02 | 2        | 51          | LNU835    | 0.809 | 1.46E-03 | 1        | 44          |
| LNU835                                                                                                                                                                                           | 0.748 | 5.16E-03 | 1        | 52          | LNU835    | 0.925 | 1.61E-05 | 1        | 48          |
| LNU835                                                                                                                                                                                           | 0.869 | 2.39E-04 | 1        | 45          | LNU835    | 0.806 | 1.54E-03 | 1        | 31          |
| LNU835                                                                                                                                                                                           | 0.784 | 2.52E-03 | 1        | 10          | LNU839    | 0.751 | 7.71E-03 | 1        | 5           |
| LNU835                                                                                                                                                                                           | 0.916 | 2.89E-05 | 1        | 30          | LNU841    | 0.792 | 3.65E-03 | 2        | 25          |
| LNU840                                                                                                                                                                                           | 0.844 | 5.57E-04 | 1        | 25          | LNU841    | 0.845 | 5.38E-04 | 1        | 36          |
| LNU841                                                                                                                                                                                           | 0.710 | 9.70E-03 | 1        | 47          | LNU841    | 0.849 | 4.80E-04 | 1        | 37          |
| LNU841                                                                                                                                                                                           | 0.854 | 4.03E-04 | 1        | 53          | LNU841    | 0.729 | 7.17E-03 | 1        | 54          |
| LNU841                                                                                                                                                                                           | 0.772 | 3.27E-03 | 1        | 55          | LNU844    | 0.716 | 8.75E-03 | 3        | 46          |
| LNU844                                                                                                                                                                                           | 0.724 | 7.79E-03 | 3        | 24          | LNU844    | 0.758 | 4.28E-03 | 3        | 20          |
| LNU844                                                                                                                                                                                           | 0.812 | 1.34E-03 | 3        | 32          | LNU844    | 0.747 | 5.21E-03 | 3        | 21          |
| LNU844                                                                                                                                                                                           | 0.717 | 8.64E-03 | 3        | 11          | LNU844    | 0.835 | 7.31E-04 | 1        | 44          |
| LNU844                                                                                                                                                                                           | 0.758 | 4.28E-03 | 3        | 22          | LNU844    | 0.727 | 7.35E-03 | 1        | 55          |
| LNU844                                                                                                                                                                                           | 0.731 | 6.88E-03 | 1        | 45          | LNU845    | 0.799 | 1.81E-03 | 3        | 33          |

Table 86.

TABLE 87

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under defoliation across maize varieties |       |          |          |             |           |       |          |          |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                  | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU814                                                                                                                                                                                     | 0.761 | 1.01E-05 | 3        | 21          | LNU819    | 0.765 | 8.32E-06 | 1        | 21          |
| LNU824                                                                                                                                                                                     | 0.720 | 4.95E-05 | 3        | 41          | LNU824    | 0.715 | 5.85E-05 | 2        | 41          |
| LNU824                                                                                                                                                                                     | 0.719 | 5.18E-05 | 2        | 11          | LNU829    | 0.725 | 7.62E-03 | 3        | 23          |
| LNU829                                                                                                                                                                                     | 0.753 | 1.41E-05 | 3        | 21          | LNU832    | 0.703 | 8.91E-05 | 1        | 21          |
| LNU835                                                                                                                                                                                     | 0.720 | 4.98E-05 | 1        | 21          | LNU813    | 0.721 | 8.15E-03 | 2        | 15          |
| LNU813                                                                                                                                                                                     | 0.740 | 5.93E-03 | 1        | 22          | LNU814    | 0.701 | 1.11E-02 | 1        | 36          |
| LNU814                                                                                                                                                                                     | 0.701 | 1.11E-02 | 3        | 24          | LNU815    | 0.766 | 3.70E-03 | 3        | 16          |
| LNU815                                                                                                                                                                                     | 0.710 | 9.74E-03 | 3        | 14          | LNU815    | 0.773 | 3.20E-03 | 1        | 18          |
| LNU815                                                                                                                                                                                     | 0.769 | 3.49E-03 | 1        | 16          | LNU816    | 0.714 | 9.14E-03 | 1        | 21          |
| LNU816                                                                                                                                                                                     | 0.751 | 4.86E-03 | 3        | 2           | LNU817    | 0.718 | 8.54E-03 | 1        | 22          |
| LNU817                                                                                                                                                                                     | 0.732 | 6.79E-03 | 3        | 24          | LNU819    | 0.754 | 4.59E-03 | 2        | 22          |
| LNU819                                                                                                                                                                                     | 0.716 | 8.80E-03 | 3        | 42          | LNU819    | 0.767 | 3.57E-03 | 2        | 2           |
| LNU819                                                                                                                                                                                     | 0.792 | 2.16E-03 | 2        | 5           | LNU819    | 0.730 | 6.98E-03 | 2        | 7           |
| LNU819                                                                                                                                                                                     | 0.733 | 6.71E-03 | 2        | 37          | LNU823    | 0.706 | 1.03E-02 | 3        | 14          |
| LNU820                                                                                                                                                                                     | 0.771 | 3.29E-03 | 1        | 36          | LNU823    | 0.738 | 6.19E-03 | 3        | 1           |
| LNU823                                                                                                                                                                                     | 0.765 | 3.78E-03 | 3        | 16          | LNU824    | 0.834 | 7.54E-04 | 1        | 36          |

TABLE 87-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under defoliation across maize varieties |       |          |          |             |           |       |          |          |             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                  | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU823                                                                                                                                                                                     | 0.764 | 3.81E-03 | 1        | 36          | LNU829    | 0.725 | 7.62E-03 | 3        | 23          |
| LNU825                                                                                                                                                                                     | 0.700 | 1.12E-02 | 3        | 8           | LNU829    | 0.870 | 2.32E-04 | 1        | 36          |
| LNU829                                                                                                                                                                                     | 0.744 | 5.55E-03 | 3        | 32          | LNU831    | 0.703 | 1.08E-02 | 3        | 31          |
| LNU829                                                                                                                                                                                     | 0.733 | 6.68E-03 | 2        | 27          | LNU833    | 0.752 | 4.82E-03 | 2        | 42          |
| LNU832                                                                                                                                                                                     | 0.712 | 9.33E-03 | 3        | 40          | LNU834    | 0.771 | 3.30E-03 | 3        | 30          |
| LNU834                                                                                                                                                                                     | 0.723 | 7.83E-03 | 3        | 2           | LNU837    | 0.748 | 5.16E-03 | 3        | 22          |
| LNU834                                                                                                                                                                                     | 0.705 | 1.05E-02 | 1        | 21          | LNU837    | 0.786 | 2.45E-03 | 2        | 22          |
| LNU837                                                                                                                                                                                     | 0.728 | 7.24E-03 | 3        | 37          | LNU837    | 0.718 | 8.55E-03 | 2        | 31          |
| LNU837                                                                                                                                                                                     | 0.768 | 3.56E-03 | 2        | 37          | LNU839    | 0.771 | 3.30E-03 | 3        | 30          |
| LNU837                                                                                                                                                                                     | 0.728 | 7.24E-03 | 2        | 24          | LNU843    | 0.709 | 9.87E-03 | 1        | 32          |
| LNU841                                                                                                                                                                                     | 0.815 | 1.23E-03 | 3        | 26          | LNU844    | 0.827 | 9.07E-04 | 1        | 2           |
| LNU844                                                                                                                                                                                     | 0.731 | 6.88E-03 | 1        | 5           | LNU845    | 0.805 | 1.57E-03 | 3        | 2           |
| LNU844                                                                                                                                                                                     | 0.808 | 1.49E-03 | 1        | 9           | LNU813    | 0.783 | 2.59E-03 | 3        | 4           |
| LNU845                                                                                                                                                                                     | 0.779 | 2.85E-03 | 1        | 30          | LNU813    | 0.737 | 6.26E-03 | 3        | 8           |
| LNU811                                                                                                                                                                                     | 0.733 | 4.40E-03 | 1        | 15          | LNU813    | 0.701 | 7.60E-03 | 1        | 11          |
| LNU813                                                                                                                                                                                     | 0.760 | 4.15E-03 | 3        | 3           | LNU814    | 0.744 | 3.54E-03 | 3        | 6           |
| LNU813                                                                                                                                                                                     | 0.749 | 3.23E-03 | 3        | 26          | LNU814    | 0.832 | 4.23E-04 | 1        | 21          |
| LNU814                                                                                                                                                                                     | 0.721 | 5.42E-03 | 3        | 1           | LNU815    | 0.806 | 8.77E-04 | 1        | 21          |
| LNU814                                                                                                                                                                                     | 0.819 | 6.19E-04 | 3        | 21          | LNU816    | 0.871 | 1.07E-04 | 3        | 9           |
| LNU815                                                                                                                                                                                     | 0.703 | 7.34E-03 | 1        | 6           | LNU816    | 0.722 | 5.28E-03 | 1        | 44          |
| LNU816                                                                                                                                                                                     | 0.724 | 5.11E-03 | 3        | 28          | LNU817    | 0.707 | 6.87E-03 | 3        | 2           |
| LNU816                                                                                                                                                                                     | 0.750 | 3.16E-03 | 1        | 40          | LNU817    | 0.716 | 5.92E-03 | 2        | 12          |
| LNU816                                                                                                                                                                                     | 0.854 | 2.00E-04 | 1        | 27          | LNU818    | 0.702 | 7.45E-03 | 1        | 39          |
| LNU817                                                                                                                                                                                     | 0.764 | 2.35E-03 | 1        | 2           | LNU818    | 0.743 | 3.64E-03 | 1        | 11          |
| LNU818                                                                                                                                                                                     | 0.791 | 1.27E-03 | 1        | 22          | LNU818    | 0.756 | 2.77E-03 | 1        | 19          |
| LNU818                                                                                                                                                                                     | 0.796 | 1.12E-03 | 1        | 38          | LNU818    | 0.765 | 2.33E-03 | 1        | 20          |
| LNU818                                                                                                                                                                                     | 0.707 | 6.93E-03 | 1        | 37          | LNU819    | 0.704 | 1.07E-02 | 3        | 4           |
| LNU818                                                                                                                                                                                     | 0.740 | 3.82E-03 | 1        | 10          | LNU819    | 0.717 | 5.84E-03 | 3        | 30          |
| LNU818                                                                                                                                                                                     | 0.733 | 4.40E-03 | 1        | 32          | LNU819    | 0.809 | 8.02E-04 | 1        | 16          |
| LNU819                                                                                                                                                                                     | 0.745 | 3.45E-03 | 3        | 28          | LNU819    | 0.731 | 4.53E-03 | 1        | 6           |
| LNU819                                                                                                                                                                                     | 0.741 | 3.75E-03 | 1        | 14          | LNU819    | 0.925 | 5.82E-06 | 1        | 21          |
| LNU819                                                                                                                                                                                     | 0.839 | 3.34E-04 | 1        | 1           | LNU821    | 0.751 | 3.07E-03 | 1        | 6           |
| LNU819                                                                                                                                                                                     | 0.830 | 4.53E-04 | 1        | 18          | LNU821    | 0.886 | 5.50E-05 | 1        | 21          |
| LNU821                                                                                                                                                                                     | 0.704 | 7.29E-03 | 1        | 1           | LNU822    | 0.710 | 6.59E-03 | 2        | 44          |
| LNU821                                                                                                                                                                                     | 0.700 | 1.12E-02 | 1        | 8           | LNU824    | 0.707 | 6.94E-03 | 1        | 41          |
| LNU822                                                                                                                                                                                     | 0.756 | 2.77E-03 | 2        | 31          | LNU825    | 0.761 | 2.54E-03 | 3        | 40          |
| LNU823                                                                                                                                                                                     | 0.709 | 9.90E-03 | 1        | 8           | LNU825    | 0.736 | 4.13E-03 | 2        | 16          |
| LNU824                                                                                                                                                                                     | 0.749 | 3.19E-03 | 1        | 43          | LNU825    | 0.749 | 3.20E-03 | 2        | 18          |
| LNU825                                                                                                                                                                                     | 0.700 | 7.70E-03 | 3        | 27          | LNU829    | 0.739 | 3.94E-03 | 3        | 14          |
| LNU825                                                                                                                                                                                     | 0.707 | 6.85E-03 | 2        | 6           | LNU829    | 0.848 | 2.48E-04 | 3        | 1           |
| LNU829                                                                                                                                                                                     | 0.757 | 4.39E-03 | 3        | 4           | LNU829    | 0.709 | 9.84E-03 | 3        | 3           |
| LNU829                                                                                                                                                                                     | 0.773 | 1.93E-03 | 3        | 16          | LNU829    | 0.931 | 3.74E-06 | 3        | 21          |
| LNU829                                                                                                                                                                                     | 0.771 | 2.02E-03 | 3        | 18          | LNU831    | 0.771 | 2.02E-03 | 2        | 10          |
| LNU829                                                                                                                                                                                     | 0.740 | 5.92E-03 | 3        | 8           | LNU832    | 0.799 | 1.05E-03 | 1        | 41          |
| LNU831                                                                                                                                                                                     | 0.714 | 6.16E-03 | 2        | 33          | LNU832    | 0.785 | 1.46E-03 | 1        | 21          |
| LNU831                                                                                                                                                                                     | 0.711 | 6.49E-03 | 2        | 20          | LNU834    | 0.723 | 5.22E-03 | 3        | 35          |
| LNU832                                                                                                                                                                                     | 0.726 | 7.53E-03 | 1        | 8           | LNU834    | 0.708 | 6.75E-03 | 1        | 33          |
| LNU832                                                                                                                                                                                     | 0.783 | 1.54E-03 | 2        | 34          | LNU835    | 0.726 | 5.00E-03 | 1        | 6           |
| LNU834                                                                                                                                                                                     | 0.746 | 3.40E-03 | 3        | 6           | LNU835    | 0.828 | 4.72E-04 | 1        | 21          |
| LNU835                                                                                                                                                                                     | 0.715 | 5.98E-03 | 1        | 1           | LNU835    | 0.756 | 2.80E-03 | 2        | 18          |
| LNU835                                                                                                                                                                                     | 0.704 | 7.26E-03 | 1        | 18          | LNU838    | 0.744 | 3.57E-03 | 1        | 41          |
| LNU835                                                                                                                                                                                     | 0.718 | 5.69E-03 | 2        | 1           | LNU838    | 0.746 | 5.33E-03 | 1        | 8           |
| LNU835                                                                                                                                                                                     | 0.841 | 3.17E-04 | 2        | 21          | LNU839    | 0.746 | 3.40E-03 | 3        | 6           |
| LNU838                                                                                                                                                                                     | 0.750 | 3.16E-03 | 1        | 40          | LNU841    | 0.719 | 5.61E-03 | 1        | 21          |
| LNU839                                                                                                                                                                                     | 0.723 | 5.22E-03 | 3        | 35          | LNU843    | 0.734 | 4.27E-03 | 2        | 27          |
| LNU839                                                                                                                                                                                     | 0.708 | 6.75E-03 | 1        | 33          | LNU846    | 0.739 | 3.91E-03 | 2        | 36          |
| LNU841                                                                                                                                                                                     | 0.745 | 3.46E-03 | 2        | 2           | LNU846    | 0.714 | 6.16E-03 | 2        | 29          |

Table 87.

## Example 11

## Production of Foxtail Millet Transcriptom and High Throughput Correlation Analysis Using 60K Foxtail Millet Oligonucleotide Micro-Array

In order to produce a high throughput correlation analysis comparing between plant phenotype and gene expression level, the present inventors utilized a foxtail millet oligonucleotide micro-array, produced by Agilent Technologies

[chem. (dot) agilent (dot) com/Scripts/PDS (dot) asp?1Page=50879]. The array oligonucleotide represents about 60K foxtail millet genes and transcripts. In order to define correlations between the levels of RNA expression and yield or vigor related parameters, various plant characteristics of 14 different foxtail millet accessions were analyzed. Among them, 11 accessions encompassing the observed variance were selected for RNA expression analysis. The correlation between the RNA levels and the char-

acterized parameters was analyzed using Pearson correlation test [davidmlane (dot) com/hyperstat/A34739 (dot) html].

#### Experimental Procedures

14 foxtail millet varieties were grown in 5 repetitive plots, in field. Briefly, the growing protocol was as follows:

1. Regular growth conditions: foxtail millet plants were grown in the field using commercial fertilization and irrigation protocols, which include 283 m<sup>3</sup> water per dunam (100 square meters) per entire growth period and fertilization of 16 units of URAN® 32% (Nitrogen Fertilizer Solution; PCS Sales, Northbrook, Ill., USA) (normal growth conditions).

2. Drought conditions: foxtail millet seeds were sown in soil and grown under normal condition until heading stage (22 days from sowing), drought treatment was imposed by irrigating plants with 50% water relative to the normal treatment from this stage (171 m<sup>3</sup> water per dunam (100 square meters) per entire growth period).

Analyzed foxtail millet tissues—All 14 foxtail millet lines were sample per each treatment. Three tissues [leaf, flower, and stem] at 2 different developmental stages [flowering, grain filling], representing different plant characteristics, were sampled and RNA was extracted as described above. Each micro-array expression information tissue type has received a Set ID as summarized in Tables 88-89 below.

TABLE 88

| Foxtail millet transcriptome expression sets under drought conditions |        |
|-----------------------------------------------------------------------|--------|
| Expression Set                                                        | Set ID |
| flower: flowering stage: drought                                      | 1      |
| leaf: flowering stage: drought                                        | 2      |
| stem: flowering stage: drought                                        | 3      |
| grain: grain filling stage: drought                                   | 4      |
| leaf: grain filling stage: drought                                    | 5      |
| stem: grain filling stage: drought                                    | 6      |

Table 88. Provided are the barley transcriptome expression sets under drought conditions

TABLE 89

| Foxtail millet transcriptome expression sets under normal conditions |        |
|----------------------------------------------------------------------|--------|
| Expression Set                                                       | Set ID |
| flower: flowering stage                                              | 1      |
| leaf: flowering stage                                                | 2      |
| grain: grain filling stage: normal                                   | 4      |
| leaf: grain filling stage: normal                                    | 5      |
| stem: grain filling stage: normal                                    | 6      |

Table 89. Provided are the barley transcriptome expression sets under normal conditions

Foxtail millet yield components and vigor related parameters assessment—Plants were continuously phenotyped during the growth period and at harvest (Table 102, below). The image analysis system included a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.37 (Java based image processing program, which was developed at the U.S. National Institutes of Health and freely available on the internet [Hypertext Transfer Protocol://rsbweb (dot) nih (dot) gov/]. Next, analyzed data was saved to text files and processed using the JMP statistical analysis software (SAS institute). The following parameters were collected using digital imaging system:

At the end of the growing period the grains were separated from the Plant ‘Head’ and the following parameters were measured and collected:

Average Grain Area (cm<sup>2</sup>)—A sample of ~200 grains was weighted, photographed and images were processed using the below described image processing system. The grain area was measured from those images and was divided by the number of grains.

Average Grain Length and width (cm)—A sample of ~200 grains was weighted, photographed and images were processed using the below described image processing system. The sum of grain lengths and width (longest axis) were measured from those images and were divided by the number of grains.

At the end of the growing period 14 ‘Heads’ were photographed and images were processed using the below described image processing system.

Average Grain Perimeter (cm)—At the end of the growing period the grains were separated from the Plant ‘Head’. A sample of ~200 grains were weighted, photographed and images were processed using the below described image processing system. The sum of grain perimeter was measured from those images and was divided by the number of grains.

Head Average Area (cm<sup>2</sup>) The ‘Head’ area was measured from those images and was divided by the number of ‘Heads’.

Head Average Length and width (mm) The ‘Head’ length and width (longest axis) were measured from those images and were divided by the number of ‘Heads’.

The image processing system was used, which consists of a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.37, Java based image processing software, which was developed at the U.S. National Institutes of Health and is freely available on the internet at Hypertext Transfer Protocol://rsbweb (dot) nih (dot) gov/. Images were captured in resolution of 10 Mega Pixels (3888×2592 pixels) and stored in a low compression JPEG (Joint Photographic Experts Group standard) format. Next, image processing output data for seed area and seed length was saved to text files and analyzed using the JMP statistical analysis software (SAS institute).

Additional parameters were collected either by sampling 5 plants per plot or by measuring the parameter across all the plants within the plot.

Head weight (gr.) and head number (num.)—At the end of the experiment, heads were harvested from each plot and were counted and weighted.

Total Grain Yield (gr.)—At the end of the experiment (plant ‘Heads’) heads from plots were collected, the heads were threshed and grains were weighted. In addition, the average grain weight per head was calculated by dividing the total grain weight by number of total heads per plot (based on plot).

1000 Seeds weight [gr]—weight of 1000 seeds per plot

Biomass at harvest—At the end of the experiment the vegetative portion above ground (excluding roots) from plots was weighted.

Total dry mater per plot—Calculated as Vegetative portion above ground plus all the heads dry weight per plot.

Num days to anthesis—Calculated as the number of days from sowing till 50% of the plot arrives anthesis.

Maintenance of performance under drought conditions: Represent ratio for the specified parameter of Drought condition results divided by Normal conditions results (maintenance of phenotype under drought in comparison to normal conditions).

Data parameters collected are summarized in Table 90, herein below.

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TABLE 90

| Foftail millet correlated parameters (vectors) |                |
|------------------------------------------------|----------------|
| Correlated parameter with                      | Correlation ID |
| 1000 grain weight (gr)                         | 1              |
| Biomass at harvest (1M) (Kg.)                  | 2              |
| Grain Perimeter (cm)                           | 3              |
| Grain area (cm <sup>2</sup> )                  | 4              |
| Grain length (cm)                              | 5              |
| Grain width (cm)                               | 6              |
| Grains yield per Head (plot) (gr)              | 7              |
| Head Area (cm <sup>2</sup> )                   | 8              |
| Head Width (cm)                                | 9              |
| Head length (cm)                               | 10             |
| Heads num                                      | 11             |
| Num days to Anthesis                           | 12             |

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TABLE 90-continued

| Foftail millet correlated parameters (vectors) |                |
|------------------------------------------------|----------------|
| Correlated parameter with                      | Correlation ID |
| Total Grains yield (gr)                        | 13             |
| Total dry matter (1M) (Kg.)                    | 14             |
| Total heads weight (Kg.)                       | 15             |

Table 90. Provided are the foftail millet collected parameters.

## Experimental Results

14 different foftail millet accessions were grown and characterized for different parameters as described above (Table 90). The average for each of the measured parameter was calculated using the JMP software and values are summarized in Tables 91-96 below. Subsequent correlation analysis between the various transcriptom sets and the average parameters (Tables 91-96) was conducted (Tables 97-99). Follow, results were integrated to the database.

TABLE 91

| Measured parameters of correlation IDs in foftail millet accessions under drought conditions |        |        |        |        |        |        |        |         |
|----------------------------------------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|---------|
| Line/<br>Cor. ID                                                                             | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8       |
| Line-1                                                                                       | 2.6392 | 1.5284 | 0.6825 | 0.0333 | 0.2416 | 0.1755 | 3.0533 | 35.7477 |
| Line-2                                                                                       | 3.3285 | 3.4592 | 0.7215 | 0.0373 | 0.2445 | 0.1943 | 8.8318 | 50.7137 |
| Line-3                                                                                       | 2.6105 | 2.8720 | 0.6888 | 0.0335 | 0.2496 | 0.1707 | 1.3364 | 18.3997 |
| Line-4                                                                                       | 2.2948 | 2.9348 | 0.6827 | 0.0319 | 0.2543 | 0.1597 | 1.0933 | 14.9379 |
| Line-5                                                                                       | 2.3036 | 3.0224 | 0.6902 | 0.0326 | 0.2568 | 0.1618 | 1.3094 | 17.6865 |
| Line-6                                                                                       | 2.6419 | 2.6648 | 0.6923 | 0.0334 | 0.2504 | 0.1701 | 0.4864 | 9.9107  |
| Line-7                                                                                       | 2.2151 | 2.9750 | 0.6481 | 0.0297 | 0.2331 | 0.1626 | 1.6279 | 20.9859 |
| Line-8                                                                                       | 1.8374 | 0.7652 | 0.5695 | 0.0238 | 0.1944 | 0.1561 | 3.7375 | 39.9290 |
| Line-9                                                                                       | 2.5396 | 2.6616 | 0.6607 | 0.0317 | 0.2230 | 0.1807 | 9.9001 | 42.1487 |
| Line-10                                                                                      | 1.6912 | 2.9464 | 0.5929 | 0.0252 | 0.2034 | 0.1581 | 4.1426 | 43.5237 |
| Line-11                                                                                      | 3.0961 | 3.2304 | 0.7204 | 0.0365 | 0.2608 | 0.1782 | 2.9746 | 26.9309 |
| Line-12                                                                                      | 2.5413 | 3.3032 | 0.6747 | 0.0321 | 0.2448 | 0.1665 | 1.3047 | 21.2295 |
| Line-13                                                                                      | 3.2382 | 2.6316 | 0.7484 | 0.0391 | 0.2700 | 0.1842 | 0.3629 | 7.3024  |
| Line-14                                                                                      | 2.2454 | 0.8856 | 0.6593 | 0.0301 | 0.2417 | 0.1586 | 1.7407 | 13.1262 |

Table 91: Provided are the values of each of the parameters (as described above) measured in Foftail millet accessions (line) under drought growth conditions. Growth conditions are specified in the experimental procedure section

TABLE 92

| Additional measured parameters of correlation IDs in foftail millet accessions under drought conditions |        |         |        |    |            |        |        |
|---------------------------------------------------------------------------------------------------------|--------|---------|--------|----|------------|--------|--------|
| Line/Cor.<br>ID                                                                                         | 9      | 10      | 11     | 12 | 13         | 14     | 15     |
| Line-1                                                                                                  | 1.8708 | 22.3630 | 374.4  | 34 | 11418.4938 | 0.5038 | 2.8880 |
| Line-2                                                                                                  | 2.6767 | 21.8851 | 127    | 41 | 1116.1782  | 0.7328 | 6.0868 |
| Line-3                                                                                                  | 1.3254 | 16.5045 | 737.8  | 51 | 988.2113   | 0.7984 | 5.3252 |
| Line-4                                                                                                  | 1.3341 | 13.3077 | 1100.8 | 41 | 1202.7733  | 0.6160 | 5.4020 |
| Line-5                                                                                                  | 1.5008 | 13.9981 | 1047.2 | 41 | 13606.5106 | 0.7079 | 5.5700 |
| Line-6                                                                                                  | 1.1661 | 9.1123  | 2050   | 30 | 995.1714   | 0.4700 | 5.2800 |
| Line-7                                                                                                  | 1.6655 | 15.0971 | 581.5  | 38 | 946.8482   | 0.6075 | 5.1205 |
| Line-8                                                                                                  | 2.1528 | 21.1335 | 311.6  | 30 | 1159.7839  | 0.3491 | 2.2884 |
| Line-9                                                                                                  | 2.3622 | 20.0249 | 147.2  | 38 | 1391.3882  | 0.4366 | 5.8340 |
| Line-10                                                                                                 | 2.3216 | 21.7995 | 95.4   | NA | 394.5104   | 0.6448 | 4.3164 |
| Line-11                                                                                                 | 1.5449 | 20.7968 | 414.4  | 44 | 1199.5016  | 0.7484 | 5.6392 |
| Line-12                                                                                                 | 1.5902 | 15.8491 | 667.8  | 51 | 872.4820   | 0.8724 | 5.1316 |
| Line-13                                                                                                 | 1.2536 | 6.4468  | 2441   | 31 | 873.9356   | 0.5228 | 5.1264 |
| Line-14                                                                                                 | 1.7376 | 9.1779  | 687.5  | 27 | 1187.9820  | 0.3605 | 2.3065 |

Table 92: Provided are the values of each of the parameters (as described above) measured in Foftail millet accessions (line) under drought growth conditions. Growth conditions are specified in the experimental procedure section

TABLE 93

| Measured parameters of correlation IDs in foxtail millet accessions for Maintenance of performance under drought conditions |           |          |           |           |           |           |           |
|-----------------------------------------------------------------------------------------------------------------------------|-----------|----------|-----------|-----------|-----------|-----------|-----------|
| Line/Cor. ID                                                                                                                | 1         | 2        | 3         | 4         | 5         | 6         | 7         |
| Line-1                                                                                                                      | 107.28492 | 63.80296 | 101.14903 | 103.09389 | 100.71910 | 102.26639 | 89.85420  |
| Line-2                                                                                                                      | 97.44009  | 86.66199 | 100.63477 | 101.05865 | 101.13165 | 100.03126 | 121.19054 |
| Line-3                                                                                                                      | 99.89264  | 90.61080 | 101.03545 | 102.80522 | 100.39213 | 102.38873 | 76.40597  |
| Line-4                                                                                                                      | 97.29088  | 81.97765 | 100.28207 | 100.87451 | 100.43193 | 100.42313 | 83.95708  |
| Line-5                                                                                                                      | 95.73134  | 84.03025 | 100.56979 | 101.56544 | 100.17700 | 101.33417 | 83.22790  |
| Line-6                                                                                                                      | 99.52308  | 87.17613 | 99.36660  | 99.75367  | 99.50116  | 100.23080 | 70.03712  |
| Line-7                                                                                                                      | 101.38380 | 73.57305 | 100.86771 | 101.13885 | 101.03305 | 100.21823 | 77.37223  |
| Line-8                                                                                                                      | 102.16287 | 66.77138 | 99.64822  | 99.96068  | 99.16887  | 100.78369 | 111.74037 |
| Line-9                                                                                                                      | 94.53807  | 83.21661 | 99.83736  | 98.88644  | 100.70881 | 98.15907  | 86.38569  |
| Line-10                                                                                                                     | 102.69124 | 75.47131 | 101.82094 | 102.67156 | 102.00421 | 100.61236 | 57.78836  |
| Line-11                                                                                                                     | 97.60676  | 90.15405 | 98.93543  | 97.94887  | 99.40096  | 98.50410  | 68.36558  |
| Line-12                                                                                                                     | 97.81459  | 89.80968 | 97.98844  | 96.37703  | 97.77776  | 98.54474  | 57.64576  |
| Line-13                                                                                                                     | 101.68636 | 89.51020 | 100.39095 | 101.18981 | 100.33465 | 100.85848 | 83.16443  |
| Line-14                                                                                                                     | 99.50250  | 59.88639 | 99.19422  | 99.24780  | 98.98318  | 100.25762 | 132.38018 |

Table 93: Provided are the values of each of the parameters (as described above) measured in Foxtail millet accessions (line) for maintenance of performance under drought (calculated as % of change under drought vs normal growth conditions). Growth conditions are specified in the experimental procedure section.

TABLE 94

| Additional measured parameters of correlation IDs in foxtail millet accessions for Maintenance of performance under drought conditions |           |           |           |           |           |          |           |
|----------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|----------|-----------|
| Line/Cor. ID                                                                                                                           | 8         | 9         | 10        | 11        | 12        | 13       | 14        |
| Line-1                                                                                                                                 | 94.50182  | 98.17799  | 96.68963  | 87.55847  | 78.74402  | 71.70254 | 75.80848  |
| Line-2                                                                                                                                 | 87.63360  | 98.29102  | 90.24976  | 85.12064  | 104.52251 | 85.76779 | 102.30604 |
| Line-3                                                                                                                                 | 93.93199  | 99.87804  | 93.97174  | 85.09804  | 64.38181  | 82.89037 | 85.90141  |
| Line-4                                                                                                                                 | 87.35732  | 98.42025  | 89.95839  | 91.42857  | 76.74662  | 66.68110 | 95.83452  |
| Line-5                                                                                                                                 | 89.50996  | 97.94159  | 91.00586  | 91.34682  | 75.80281  | 78.32485 | 88.82439  |
| Line-6                                                                                                                                 | 105.26046 | 98.75548  | 106.44273 | 96.15385  | 67.41849  | 98.01877 | 86.91644  |
| Line-7                                                                                                                                 | 91.55461  | 98.97568  | 93.88055  | 77.30657  | 59.82989  | 66.27755 | 81.03596  |
| Line-8                                                                                                                                 | 97.65054  | 101.33701 | 96.59358  | 79.04617  | 88.00374  | 77.03001 | 81.18348  |
| Line-9                                                                                                                                 | 93.05666  | 94.53334  | 98.09741  | 78.88532  | 65.27431  | 73.53882 | 80.43346  |
| Line-10                                                                                                                                | 88.21016  | 95.66287  | 93.49773  | 72.38240  | 42.06192  | 64.63512 | 82.30493  |
| Line-11                                                                                                                                | 97.27140  | 99.48243  | 99.65504  | 95.43989  | 63.79603  | 81.97152 | 85.75426  |
| Line-12                                                                                                                                | 87.80382  | 100.35077 | 88.13167  | 103.31064 | 61.13590  | 84.96299 | 87.70167  |
| Line-13                                                                                                                                | 102.45818 | 100.81763 | 101.47055 | 87.24712  | 71.85533  | 83.88960 | 91.15220  |
| Line-14                                                                                                                                | 89.37679  | 95.46426  | 93.80683  | 69.12327  | 91.61620  | 77.76100 | 84.42533  |

Table 94: Provided are the values of each of the parameters (as described above) measured in Foxtail millet accessions (line) for maintenance of performance under drought (calculated as % of change under drought vs normal growth conditions). Growth conditions are specified in the experimental procedure section.

TABLE 95

| Measured parameters of correlation IDs in foxtail millet accessions under normal conditions |         |         |         |         |         |         |          |
|---------------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|----------|
| Line/Cor. ID                                                                                | 1       | 2       | 3       | 4       | 5       | 6       | 7        |
| Line-1                                                                                      | 2.45995 | 2.39550 | 0.67477 | 0.03230 | 0.23989 | 0.17157 | 3.39810  |
| Line-2                                                                                      | 3.41596 | 3.99160 | 0.71695 | 0.03689 | 0.24172 | 0.19428 | 7.28754  |
| Line-3                                                                                      | 2.61327 | 3.16960 | 0.68170 | 0.03255 | 0.24860 | 0.16670 | 1.74902  |
| Line-4                                                                                      | 2.35874 | 3.58000 | 0.68083 | 0.03161 | 0.25317 | 0.15900 | 1.30220  |
| Line-5                                                                                      | 2.40635 | 3.59680 | 0.68626 | 0.03213 | 0.25634 | 0.15968 | 1.57325  |
| Line-6                                                                                      | 2.65459 | 3.05680 | 0.69667 | 0.03353 | 0.25168 | 0.16966 | 0.69451  |
| Line-7                                                                                      | 2.18488 | 4.04360 | 0.64249 | 0.02941 | 0.23076 | 0.16223 | 2.10395  |
| Line-8                                                                                      | 1.79847 | 1.14600 | 0.57148 | 0.02386 | 0.19607 | 0.15493 | 3.34479  |
| Line-9                                                                                      | 2.68629 | 3.19840 | 0.66174 | 0.03201 | 0.22145 | 0.18410 | 11.46040 |
| Line-10                                                                                     | 1.64690 | 3.90400 | 0.58226 | 0.02458 | 0.19936 | 0.15712 | 7.16855  |
| Line-11                                                                                     | 3.17197 | 3.58320 | 0.72818 | 0.03729 | 0.26240 | 0.18093 | 4.35102  |

TABLE 95-continued

| Measured parameters of correlation IDs in foxtail millet accessions<br>under normal conditions |         |         |         |         |         |         |         |
|------------------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|
| Line/Cor.<br>ID                                                                                | 1       | 2       | 3       | 4       | 5       | 6       | 7       |
| Line-12                                                                                        | 2.59803 | 3.67800 | 0.68858 | 0.03326 | 0.25037 | 0.16901 | 2.26328 |
| Line-13                                                                                        | 3.18446 | 2.94000 | 0.74550 | 0.03864 | 0.26910 | 0.18267 | 0.43640 |
| Line-14                                                                                        | 2.25661 | 1.47880 | 0.66464 | 0.03032 | 0.24416 | 0.15822 | 1.31493 |

Table 95: Provided are the values of each of the parameters (as described above) measured in Foxtail millet accessions (line) under normal growth conditions. Growth conditions are specified in the experimental procedure section

TABLE 96

| Additional measured parameters of correlation IDs in foxtail millet<br>accessions under normal conditions |          |         |          |            |            |         |         |
|-----------------------------------------------------------------------------------------------------------|----------|---------|----------|------------|------------|---------|---------|
| Line/Cor.<br>ID                                                                                           | 8        | 9       | 10       | 11         | 12         | 13      | 14      |
| Line-1                                                                                                    | 37.82752 | 1.90548 | 23.12861 | 427.60000  | 1449.62604 | 0.70263 | 3.80960 |
| Line-2                                                                                                    | 57.87014 | 2.72325 | 24.24950 | 149.20000  | 1067.88312 | 0.85440 | 5.94960 |
| Line-3                                                                                                    | 19.58832 | 1.32700 | 17.56325 | 867.00000  | 1534.92310 | 0.96320 | 6.19920 |
| Line-4                                                                                                    | 17.09980 | 1.35550 | 14.79317 | 1204.00000 | 1567.20040 | 0.92380 | 5.63680 |
| Line-5                                                                                                    | 19.75921 | 1.53239 | 15.38157 | 1146.40000 | 1794.80240 | 0.90380 | 6.27080 |
| Line-6                                                                                                    | 9.41542  | 1.18075 | 8.56073  | 2132.00000 | 1476.11048 | 0.47950 | 6.07480 |
| Line-7                                                                                                    | 22.92173 | 1.68275 | 16.08119 | 752.20000  | 1582.56728 | 0.91660 | 6.31880 |
| Line-8                                                                                                    | 40.88973 | 2.12436 | 21.87883 | 394.20000  | 1317.88024 | 0.45320 | 2.81880 |
| Line-9                                                                                                    | 45.29355 | 2.49875 | 20.41332 | 186.60000  | 2131.60156 | 0.59370 | 7.25320 |
| Line-10                                                                                                   | 49.34091 | 2.42686 | 23.31557 | 131.80000  | 937.92760  | 0.99760 | 5.24440 |
| Line-11                                                                                                   | 27.68630 | 1.55289 | 20.86882 | 434.20000  | 1880.21340 | 0.91300 | 6.57600 |
| Line-12                                                                                                   | 24.17832 | 1.58464 | 17.98348 | 646.40000  | 1427.11884 | 1.02680 | 5.85120 |
| Line-13                                                                                                   | 7.12724  | 1.24343 | 6.35334  | 2797.80000 | 1216.24320 | 0.62320 | 5.62400 |
| Line-14                                                                                                   | 14.68632 | 1.82013 | 9.78380  | 994.60000  | 1296.69424 | 0.46360 | 2.73200 |

Table 96: Provided are the values of each of the parameters (as described above) measured in Foxtail millet accessions (line) under normal growth conditions. Growth conditions are specified in the experimental procedure section

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TABLE 97

| Correlation between the expression level of selected genes of some embodiments<br>of the invention in various tissues and the phenotypic performance under drought<br>conditions across foxtail millet varieties |       |          |             |                |              |       |          |             |                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|-------------|----------------|--------------|-------|----------|-------------|----------------|
| Gene<br>Name                                                                                                                                                                                                     | R     | P value  | Exp.<br>set | Cor.<br>Set ID | Gene<br>Name | R     | P value  | Exp.<br>set | Cor.<br>Set ID |
| LNU801                                                                                                                                                                                                           | 0.761 | 1.05E-02 | 2           | 16             | LNU801       | 0.789 | 6.66E-03 | 2           | 2              |
| LNU801                                                                                                                                                                                                           | 0.735 | 1.55E-02 | 2           | 17             | LNU802       | 0.846 | 3.37E-02 | 1           | 1              |
| LNU802                                                                                                                                                                                                           | 0.817 | 4.71E-02 | 1           | 4              | LNU802       | 0.817 | 4.72E-02 | 1           | 10             |
| LNU802                                                                                                                                                                                                           | 0.750 | 8.58E-02 | 1           | 3              | LNU802       | 0.795 | 5.87E-02 | 1           | 11             |
| LNU802                                                                                                                                                                                                           | 0.785 | 6.42E-02 | 1           | 8              | LNU802       | 0.870 | 2.42E-02 | 1           | 6              |
| LNU802                                                                                                                                                                                                           | 0.854 | 3.03E-02 | 1           | 9              | LNU803       | 0.824 | 4.40E-02 | 1           | 13             |
| LNU804                                                                                                                                                                                                           | 0.736 | 9.50E-02 | 1           | 12             | LNU804       | 0.711 | 1.13E-01 | 1           | 7              |
| LNU805                                                                                                                                                                                                           | 0.795 | 5.97E-03 | 2           | 7              | LNU806       | 0.797 | 5.77E-02 | 1           | 7              |
| LNU806                                                                                                                                                                                                           | 0.756 | 1.14E-02 | 2           | 1              | LNU806       | 0.816 | 3.96E-03 | 2           | 6              |
| LNU807                                                                                                                                                                                                           | 0.760 | 7.96E-02 | 1           | 15             | LNU807       | 0.865 | 2.60E-02 | 1           | 10             |
| LNU807                                                                                                                                                                                                           | 0.792 | 6.05E-02 | 1           | 11             | LNU807       | 0.857 | 2.91E-02 | 1           | 8              |
| LNU807                                                                                                                                                                                                           | 0.873 | 2.30E-02 | 1           | 9              | LNU807       | 0.739 | 1.47E-02 | 2           | 10             |
| LNU807                                                                                                                                                                                                           | 0.803 | 5.12E-03 | 2           | 8              | LNU807       | 0.737 | 1.50E-02 | 2           | 9              |
| LNU808                                                                                                                                                                                                           | 0.828 | 3.12E-03 | 2           | 5              | LNU809       | 0.703 | 1.19E-01 | 1           | 16             |
| LNU809                                                                                                                                                                                                           | 0.721 | 1.06E-01 | 1           | 2              | LNU809       | 0.709 | 2.16E-02 | 3           | 15             |
| LNU810                                                                                                                                                                                                           | 0.713 | 2.07E-02 | 2           | 13             | LNU810       | 0.705 | 2.28E-02 | 3           | 16             |
| LNU810                                                                                                                                                                                                           | 0.703 | 2.33E-02 | 3           | 13             |              |       |          |             |                |

Table 97. Correlations (R) between the genes expression levels in various tissues and the phenotypic performance.

“Corr. ID”—correlation set ID according to the correlated parameters Table above.

“Exp. Set”—Expression set.

“R” = Pearson correlation coefficient;

“P” = p value.

TABLE 98

| Correlation between the expression level of selected genes of some<br>embodiments of the invention in various tissues and the<br>phenotypic performance of maintenance of performance<br>under drought conditions across foxtail millet varieties |       |          |             |                |              |       |          |             |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|-------------|----------------|--------------|-------|----------|-------------|----------------|
| Gene Name                                                                                                                                                                                                                                         | R     | P value  | Exp.<br>set | Cor. Set<br>ID | Gene<br>Name | R     | P value  | Exp.<br>set | Cor. Set<br>ID |
| LNU802                                                                                                                                                                                                                                            | 0.736 | 1.53E-02 | 1           | 1              | LNU802       | 0.818 | 3.82E-03 | 1           | 16             |
| LNU802                                                                                                                                                                                                                                            | 0.711 | 2.11E-02 | 1           | 13             | LNU804       | 0.728 | 2.62E-02 | 3           | 1              |
| LNU804                                                                                                                                                                                                                                            | 0.701 | 3.55E-02 | 3           | 6              | LNU804       | 0.917 | 7.23E-05 | 2           | 1              |
| LNU804                                                                                                                                                                                                                                            | 0.883 | 3.20E-04 | 2           | 4              | LNU804       | 0.808 | 2.61E-03 | 2           | 3              |
| LNU804                                                                                                                                                                                                                                            | 0.863 | 6.21E-04 | 2           | 6              | LNU807       | 0.712 | 1.40E-02 | 2           | 11             |
| LNU810                                                                                                                                                                                                                                            | 0.761 | 1.06E-02 | 1           | 16             | LNU810       | 0.706 | 2.25E-02 | 1           | 13             |
| LNU802                                                                                                                                                                                                                                            | 0.736 | 1.53E-02 | 1           | 1              | LNU802       | 0.818 | 3.82E-03 | 1           | 16             |
| LNU802                                                                                                                                                                                                                                            | 0.711 | 2.11E-02 | 1           | 13             | LNU804       | 0.728 | 2.62E-02 | 3           | 1              |
| LNU804                                                                                                                                                                                                                                            | 0.701 | 3.55E-02 | 3           | 6              | LNU804       | 0.917 | 7.23E-05 | 2           | 1              |
| LNU804                                                                                                                                                                                                                                            | 0.883 | 3.20E-04 | 2           | 4              | LNU804       | 0.808 | 2.61E-03 | 2           | 3              |
| LNU804                                                                                                                                                                                                                                            | 0.863 | 6.21E-04 | 2           | 6              | LNU807       | 0.712 | 1.40E-02 | 2           | 11             |
| LNU810                                                                                                                                                                                                                                            | 0.761 | 1.06E-02 | 1           | 16             | LNU810       | 0.706 | 2.25E-02 | 1           | 13             |

Table 98. Correlations (R) between the genes expression levels in various tissues and the phenotypic performance.

"Corr. ID"—correlation set ID according to the correlated parameters Table above.

"Exp. Set"—Expression set.

"R" = Pearson correlation coefficient;

"P" = p value.

TABLE 99

| Correlation between the expression level of selected genes of some embodiments of<br>the invention in various tissues and the phenotypic performance under normal<br>conditions across foxtail millet varieties |       |          |             |                   |              |       |          |             |                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|-------------|-------------------|--------------|-------|----------|-------------|----------------|
| Gene<br>Name                                                                                                                                                                                                    | R     | P value  | Exp.<br>set | Cor.<br>Set<br>ID | Gene<br>Name | R     | P value  | Exp.<br>set | Cor.<br>Set ID |
| LNU801                                                                                                                                                                                                          | 0.752 | 1.22E-02 | 2           | 15                | LNU802       | 0.711 | 1.42E-02 | 1           | 16             |
| LNU802                                                                                                                                                                                                          | 0.740 | 9.19E-03 | 1           | 13                | LNU803       | 0.704 | 2.30E-02 | 2           | 12             |
| LNU804                                                                                                                                                                                                          | 0.703 | 1.59E-02 | 1           | 5                 | LNU804       | 0.748 | 8.11E-03 | 1           | 4              |
| LNU804                                                                                                                                                                                                          | 0.779 | 4.76E-03 | 1           | 3                 | LNU805       | 0.748 | 1.29E-02 | 2           | 12             |
| LNU806                                                                                                                                                                                                          | 0.814 | 4.13E-03 | 2           | 11                | LNU807       | 0.765 | 6.06E-03 | 1           | 16             |
| LNU807                                                                                                                                                                                                          | 0.713 | 1.38E-02 | 1           | 2                 | LNU809       | 0.786 | 4.09E-03 | 1           | 12             |
| LNU809                                                                                                                                                                                                          | 0.811 | 4.42E-03 | 2           | 17                | LNU801       | 0.703 | 5.17E-02 | 3           | 1              |
| LNU801                                                                                                                                                                                                          | 0.783 | 7.38E-03 | 2           | 8                 | LNU801       | 0.823 | 1.21E-02 | 3           | 6              |
| LNU801                                                                                                                                                                                                          | 0.759 | 2.90E-02 | 3           | 17                | LNU801       | 0.744 | 9.00E-02 | 1           | 11             |
| LNU801                                                                                                                                                                                                          | 0.832 | 4.00E-02 | 1           | 10                | LNU801       | 0.810 | 5.07E-02 | 1           | 9              |
| LNU801                                                                                                                                                                                                          | 0.787 | 6.31E-02 | 1           | 6                 | LNU802       | 0.756 | 1.13E-02 | 2           | 13             |
| LNU802                                                                                                                                                                                                          | 0.764 | 1.01E-02 | 2           | 14                | LNU802       | 0.904 | 2.09E-03 | 3           | 4              |
| LNU802                                                                                                                                                                                                          | 0.878 | 4.14E-03 | 3           | 1                 | LNU802       | 0.817 | 4.70E-02 | 1           | 1              |
| LNU802                                                                                                                                                                                                          | 0.844 | 8.46E-03 | 3           | 3                 | LNU802       | 0.764 | 7.68E-02 | 1           | 11             |
| LNU802                                                                                                                                                                                                          | 0.890 | 1.75E-02 | 1           | 10                | LNU802       | 0.863 | 2.68E-02 | 1           | 9              |
| LNU802                                                                                                                                                                                                          | 0.866 | 2.57E-02 | 1           | 6                 | LNU803       | 0.833 | 3.94E-02 | 1           | 15             |
| LNU803                                                                                                                                                                                                          | 0.800 | 1.72E-02 | 3           | 15                | LNU804       | 0.886 | 1.88E-02 | 1           | 11             |
| LNU804                                                                                                                                                                                                          | 0.837 | 3.77E-02 | 1           | 10                | LNU804       | 0.834 | 3.91E-02 | 1           | 6              |
| LNU804                                                                                                                                                                                                          | 0.717 | 1.09E-01 | 1           | 8                 | LNU805       | 0.774 | 8.66E-03 | 2           | 5              |
| LNU804                                                                                                                                                                                                          | 0.844 | 3.47E-02 | 1           | 9                 | LNU805       | 0.828 | 4.18E-02 | 1           | 10             |
| LNU805                                                                                                                                                                                                          | 0.722 | 1.83E-02 | 2           | 7                 | LNU805       | 0.778 | 6.84E-02 | 1           | 6              |
| LNU805                                                                                                                                                                                                          | 0.938 | 5.71E-03 | 1           | 8                 | LNU806       | 0.838 | 2.47E-03 | 2           | 8              |
| LNU805                                                                                                                                                                                                          | 0.726 | 1.03E-01 | 1           | 9                 | LNU806       | 0.733 | 1.60E-02 | 2           | 9              |
| LNU806                                                                                                                                                                                                          | 0.793 | 6.19E-03 | 2           | 6                 | LNU806       | 0.715 | 4.63E-02 | 3           | 11             |
| LNU806                                                                                                                                                                                                          | 0.700 | 5.30E-02 | 3           | 15                | LNU806       | 0.741 | 9.19E-02 | 1           | 4              |
| LNU806                                                                                                                                                                                                          | 0.818 | 4.65E-02 | 1           | 1                 | LNU806       | 0.985 | 3.40E-04 | 1           | 11             |
| LNU806                                                                                                                                                                                                          | 0.854 | 3.02E-02 | 1           | 10                | LNU806       | 0.936 | 5.93E-03 | 1           | 9              |
| LNU806                                                                                                                                                                                                          | 0.902 | 1.40E-02 | 1           | 6                 | LNU807       | 0.765 | 9.98E-03 | 2           | 8              |
| LNU807                                                                                                                                                                                                          | 0.766 | 9.71E-03 | 2           | 10                | LNU807       | 0.823 | 1.20E-02 | 3           | 12             |
| LNU807                                                                                                                                                                                                          | 0.806 | 4.89E-03 | 2           | 9                 | LNU807       | 0.816 | 4.77E-02 | 1           | 10             |
| LNU807                                                                                                                                                                                                          | 0.750 | 8.57E-02 | 1           | 1                 | LNU807       | 0.810 | 5.07E-02 | 1           | 6              |
| LNU807                                                                                                                                                                                                          | 0.709 | 1.14E-01 | 1           | 11                | LNU808       | 0.725 | 4.19E-02 | 3           | 4              |
| LNU807                                                                                                                                                                                                          | 0.803 | 5.44E-02 | 1           | 9                 | LNU808       | 0.871 | 4.83E-03 | 3           | 12             |
| LNU808                                                                                                                                                                                                          | 0.766 | 2.65E-02 | 3           | 3                 | LNU808       | 0.955 | 3.05E-03 | 1           | 10             |
| LNU808                                                                                                                                                                                                          | 0.716 | 1.09E-01 | 1           | 1                 | LNU808       | 0.902 | 1.38E-02 | 1           | 6              |
| LNU808                                                                                                                                                                                                          | 0.867 | 2.53E-02 | 1           | 8                 | LNU809       | 0.706 | 2.25E-02 | 2           | 2              |
| LNU808                                                                                                                                                                                                          | 0.881 | 2.06E-02 | 1           | 9                 | LNU809       | 0.823 | 1.21E-02 | 3           | 10             |
| LNU809                                                                                                                                                                                                          | 0.828 | 1.11E-02 | 3           | 15                | LNU809       | 0.930 | 8.08E-04 | 3           | 8              |
| LNU809                                                                                                                                                                                                          | 0.856 | 6.71E-03 | 3           | 11                | LNU809       | 0.885 | 1.91E-02 | 1           | 16             |
| LNU809                                                                                                                                                                                                          | 0.981 | 1.74E-05 | 3           | 9                 | LNU809       | 0.770 | 7.31E-02 | 1           | 13             |

TABLE 99-continued

| Correlation between the expression level of selected genes of some embodiments of the invention in various tissues and the phenotypic performance under normal conditions across foxtail millet varieties |       |          |          |             |           |       |          |          |             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----------|----------|-------------|-----------|-------|----------|----------|-------------|
| Gene Name                                                                                                                                                                                                 | R     | P value  | Exp. set | Cor. Set ID | Gene Name | R     | P value  | Exp. set | Cor. Set ID |
| LNU809                                                                                                                                                                                                    | 0.872 | 2.37E-02 | 1        | 5           | LNU810    | 0.722 | 1.85E-02 | 2        | 16          |
| LNU809                                                                                                                                                                                                    | 0.792 | 6.03E-02 | 1        | 12          | LNU810    | 0.724 | 4.22E-02 | 3        | 16          |
| LNU810                                                                                                                                                                                                    | 0.785 | 7.20E-03 | 2        | 13          | LNU810    | 0.707 | 1.16E-01 | 1        | 13          |
| LNU810                                                                                                                                                                                                    | 0.722 | 4.31E-02 | 3        | 14          | LNU810    | 0.792 | 6.04E-02 | 1        | 12          |

Table 99. Correlations (R) between the genes expression levels in various tissues and the phenotypic performance.

"Corr. ID"—correlation set ID according to the correlated parameters Table above.

"Exp. Set"—Expression set.

"R" = Pearson correlation coefficient;

"P" = p value.

## Example 12

## Gene Cloning and Generation of Binary Vectors for Plant Expression

To validate their role in improving yield, selected genes were over-expressed in plants, as follows.

## Cloning Strategy

Selected genes from those presented in Examples 1-13 hereinabove were cloned into binary vectors for the generation of transgenic plants. For cloning, the full-length open reading frames (ORFs) were identified. EST clusters and in some cases mRNA sequences were analyzed to identify the entire open reading frame by comparing the results of several translation algorithms to known proteins from other plant species.

In order to clone the full-length cDNAs, reverse transcription (RT) followed by polymerase chain reaction (PCR; RT-PCR) was performed on total RNA extracted from leaves, roots or other plant tissues, growing under normal/limiting or stress conditions. Total RNA extraction, production of cDNA and PCR amplification was performed using standard protocols described elsewhere (Sambrook J., E. F. Fritsch, and T. Maniatis. 1989. Molecular Cloning. A Laboratory Manual, 2nd Ed. Cold Spring Harbor Laboratory Press, New York.) which are well known to those skilled in the art. PCR products were purified using PCR purification kit (Qiagen).

Usually, 2 sets of primers were prepared for the amplification of each gene, via nested PCR (if required). Both sets of primers were used for amplification on a cDNA. In case no product was obtained, a nested PCR reaction was performed. Nested PCR was performed by amplification of the gene using external primers and then using the produced PCR product as a template for a second PCR reaction, where the internal set of primers were used. Alternatively, one or two of the internal primers were used for gene amplification, both in the first and the second PCR reactions (meaning only 2-3 primers are designed for a gene). To facilitate further cloning of the cDNAs, an 8-12 base pairs (bp) extension was added to the 5' of each internal primer. The primer extension includes an endonuclease restriction site. The restriction sites were selected using two parameters: (a) the restriction site does not exist in the cDNA sequence; and (b) the restriction sites in the forward and reverse primers were designed such that the digested cDNA was inserted in the sense direction into the binary vector utilized for transformation.

PCR products were digested with the restriction endonucleases (New England BioLabs Inc) according to the sites designed in the primers. Each digested/undigested PCR product was inserted into a high copy vector pUC19 (New England BioLabs Inc), or into plasmids originating from this vector. In some cases the undigested PCR product was inserted into pCR-Blunt II-TOPO (Invitrogen) or into pJET1.2 (CloneJET PCR Cloning Kit, Thermo Scientific) or directly into the binary vector. The digested/undigested products and the linearized plasmid vector were ligated using T4 DNA ligase enzyme (Roche, Switzerland or other manufacturers). In cases where pCR-Blunt II-TOPO is used no T4 ligase is needed.

Sequencing of the inserted genes was performed, using the ABI 377 sequencer (Applied Biosystems). In some cases, after confirming the sequences of the cloned genes, the cloned cDNA was introduced into a modified pGI binary vector containing the At6669 promoter (e.g., pQFNc) and the NOS terminator (SEQ ID NO: 4891) via digestion with appropriate restriction endonucleases.

In case of *Brachypodium* transformation, after confirming the sequences of the cloned genes, the cloned cDNAs were introduced into pEBbVNi (FIG. 9A) containing 35S promoter (SEQ ID NO: 4892) and the NOS terminator (SEQ ID NO:4891) via digestion with appropriate restriction endonucleases. The genes were cloned downstream to the 35S promoter and upstream to the NOS terminator.

Several DNA sequences of the selected genes were synthesized by GeneArt (Life Technologies, Grand Island, N.Y., USA). Synthetic DNA was designed in silico. Suitable restriction enzymes sites were added to the cloned sequences at the 5' end and at the 3' end to enable later cloning into the desired binary vector.

## Binary vectors—

The pPI plasmid vector was constructed by inserting a synthetic poly-(A) signal sequence, originating from pGL3 basic plasmid vector (Promega, GenBank Accession No. U47295; nucleotides 4658-4811) into the HindIII restriction site of the binary vector pBI101.3 (Clontech, GenBank Accession No. U12640). pGI is similar to pPI, but the original gene in the backbone is GUS-Intron and not GUS.

The modified pGI vector (e.g., pQFN, pQFNc, pQYN\_6669, pQNa\_RP, pQFYN or pQXNc) is a modified version of the pGI vector in which the cassette is inverted between the left and right borders so the gene and its corresponding promoter are close to the right border and the NPTII gene is close to the left border.

At6669, the new *Arabidopsis thaliana* promoter sequence (SEQ ID NO:4880) was inserted in the modified pGI binary

vector, upstream to the cloned genes, followed by DNA ligation and binary plasmid extraction from positive *E. coli* colonies, as described above. Colonies were analyzed by PCR using the primers covering the insert which were designed to span the introduced promoter and gene. Positive plasmids were identified, isolated and sequenced.

pEBbVNi (FIG. 9A) is a modified version of pJJ2LB in which the Hygromycin resistance gene was replaced with the BAR gene which confers resistance to the BASTA herbicide [BAR gene coding sequence is provided in Gen-Bank Accession No. JQ293091.1 (SEQ ID NO:5436); further description is provided in Akama K, et al. “Efficient *Agrobacterium*-mediated transformation of *Arabidopsis thaliana* using the bar gene as selectable marker”, Plant Cell Rep. 1995, 14(7):450-4; Christiansen P, et al. “A rapid and

efficient transformation protocol for the grass *Brachypodium distachyon*”, Plant Cell Rep. 2005 March; 23(10-11): 751-8. Epub 2004 Oct. 19; and Păcurar D I, et al. “A high-throughput *Agrobacterium*-mediated transformation system for the grass model species *Brachypodium distachyon* L”, Transgenic Res. 2008 17(5):965-75; each of which is fully incorporated herein by reference in its entirety]. The pEBbVNi construct contains the 35S promoter (SEQ ID NO:4892). pJJ2LB is a modified version of pCambia0305.2 (Cambia).

In case genomic DNA was cloned, the genes were amplified by direct PCR on genomic DNA extracted from leaf tissue using the DNAeasy kit (Qiagen Cat. No. 69104).

Selected genes cloned by the present inventors are provided in Table 100 below.

TABLE 100

| Gene Name | High copy plasmid | Organism                          | Primers used SEQ ID NOs: | Polynucleotide SEQ ID NO: | Polypeptide SEQ ID NO: |
|-----------|-------------------|-----------------------------------|--------------------------|---------------------------|------------------------|
| LNU749    | pQFNe_LNU749      | barley                            | 5383, 4897, 5412, 4906   | 289                       | 747                    |
| LNU750    | pQFNe_LNU750      | barley                            | 5182, 5357, 5182, 5245   | 2                         | 497                    |
| LNU751    | pQFNe_LNU751      | barley                            | 5096, 5214, 5073, 5362   | 290                       | 498                    |
| LNU752    | pUC19c_LNU752     | barley                            | 5087, 5232, 5087, 5232   | 291                       | 748                    |
| LNU753    | pQFNe_LNU753      | barley                            | 5416, 4974, 5416, 4972   | 292                       | 500                    |
| LNU754    | pQFNe_LNU754      | barley                            | 5067, 5338, 5067, 5338   | 293                       | 501                    |
| LNU756    | pQFNe_LNU756      | barley                            | 5019, 5321, 5164, 5326   | 294                       | 502                    |
| LNU757    | pQFNe_LNU757      | barley                            | 5088, 5273, 5137, 5257   | 295                       | 503                    |
| LNU758    | pMA-RQ_LNU758_GA  |                                   |                          | 296                       | 504                    |
| LNU759    | pQFNe_LNU759      | barley                            | 5392, 4949, 5402, 4976   | 297                       | 505                    |
| LNU760_H1 | pQFNe_LNU760_H1   | <i>brachypodium</i>               | 5043, 5359, 5043, 5359   | 491                       | 708                    |
| LNU761    | pUC19c_LNU761     | barley                            | 5373, 4954, 5373, 4962   | 298                       | 507                    |
| LNU762    | pQFNe_LNU762      | barley                            | 5371, 4898, 5391, 4912   | 299                       | 508                    |
| LNU763    | pQFNe_LNU763      | barley                            | 5149, 5349, 5026, 5228   | 300                       | 509                    |
| LNU764    | pUC19c_LNU764     | barley                            | 5396, 4899, 5396, 4913   | 301                       | 510                    |
| LNU766    | pUC19c_LNU766     | barley                            | 5125, 4965, 5125, 4965   | 302                       | 749                    |
| LNU767    | pMA_LNU767_GA     |                                   |                          | 303                       | 512                    |
| LNU768    | pQFNe_LNU768      | barley                            | 5146, 5345, 5146, 5332   | 304                       | 513                    |
| LNU769    | pUC19c_LNU769     | barley                            | 4929, 4987, 4929, 4989   | 305                       | 750                    |
| LNU770    | pQFNe_LNU770      | barley                            | 5201, 5316, 5061, 5240   | 306                       | 515                    |
| LNU771    | pQFNe_LNU771      | barley                            | 5175, 5242, 5175, 5242   | 307                       | 516                    |
| LNU772    | TopoB_LNU772      | barley                            | 5107, 5351, 5107, 5285   | 308                       | 517                    |
| LNU773    | TopoB_LNU773      | barley                            | 5165, 4960, 5165, 4960   | 309                       | 751                    |
| LNU774    | pQFNe_LNU774      | barley                            | 4928, 4943, 4928, 4943   | 310                       | 519                    |
| LNU775    | pQFNe_LNU775      | barley                            | 5389, 5183, 5389, 5183   | 311                       | 520                    |
| LNU776    | pUC19_LNU776      | barley                            | 5075, 5266, 5085, 5266   | 312                       | 752                    |
| LNU777    | pQFNe_LNU777      | barley                            | 5174, 5205, 5174, 5205   | 313                       | 522                    |
| LNU778    | pMK-RQ_LNU778_GA  |                                   |                          | 314                       | 523                    |
| LNU779    | pQFNe_LNU779      | barley                            | 5428, 4902, 5403, 4895   | 315                       | 524                    |
| LNU780    | pQFNe_LNU780      | barley                            | 5098, 5354, 5098, 5354   | 316                       | 753                    |
| LNU781    | pMA-RQ_LNU781_GA  |                                   |                          | 317                       | 526                    |
| LNU782    | pQFNe_LNU782      | barley                            | 5415, 4996, 5415, 4996   | 318                       | 527                    |
| LNU783    | pQFNe_LNU783      | barley                            | 5103, 5212, 5160, 5238   | 319                       | 528                    |
| LNU784    | pQFNe_LNU784      | barley                            | 5143, 5243, 5143, 5243   | 320                       | 754                    |
| LNU785    | TopoB_LNU785      | barley                            | 5111, 5246, 5056, 5282   | 321                       | 530                    |
| LNU786    | TopoB_LNU786      | barley                            | 5082, 5010, 5082, 5000   | 322                       | 755                    |
| LNU787    | pMA-RQ_LNU787_GA  |                                   |                          | 323                       | 532                    |
| LNU788    | pQFNe_LNU788      | <i>brachypodium</i>               | 5184, 5310, 5153, 5227   | 324                       | 756                    |
| LNU789    | pQFNe_LNU789      | <i>brachypodium</i>               | 5409, 5001, 5414, 5013   | 325                       | 534                    |
| LNU790    | pQFNe_LNU790      | <i>brachypodium</i>               | 5101, 5237, 5101, 5237   | 326                       | 535                    |
| LNU791    | pQFNe_LNU791      | <i>brachypodium</i>               | 5080, 5203, 5080, 5203   | 327                       | 536                    |
| LNU792    | pQFNe_LNU792      | <i>brachypodium</i>               | 5055, 5003, 5018, 5006   | 328                       | 537                    |
| LNU793    | pUC19c_LNU793     | <i>brachypodium</i>               | 5144, 5253, 5023, 5343   | 329                       | 538                    |
| LNU794    | pMA-T_LNU794_GA   |                                   |                          | 330                       | 539                    |
| LNU795    | pQFNe_LNU795      | <i>brachypodium</i>               | 5119, 5234, 5119, 5234   | 331                       | 757                    |
| LNU796    | pQFNe_LNU796      | <i>brachypodium</i>               | 5400, 4971, 5400, 4971   | 332                       | 541                    |
| LNU797    | pQFNe_LNU797      | <i>brachypodium</i>               | 5148, 5358, 5123, 5287   | 333                       | 542                    |
| LNU798    | pMA-RQ_LNU798_GA  |                                   |                          | 334                       | 543                    |
| LNU799    | pQFNe_LNU799      | <i>Brachypodium distachyon</i> ND | 5390, 5028, 5390, 5028   | 335                       | 544                    |
| LNU800    | pQFNe_LNU800      | <i>brachypodium</i>               | 5063, 5337, 5069, 5236   | 336                       | 545                    |
| LNU801    | pUC19d_LNU801     | foxtail_millet                    | 5002, 4923, 5002, 4930   | 337                       | 546                    |
| LNU802    | pUC19c_LNU802     | foxtail_millet                    | 5186, 5344, 5186, 5262   | 338                       | 547                    |
| LNU803    | pQFNe_LNU803      | foxtail_millet                    | 5092, 5218, 5052, 5356   | 339                       | 548                    |
| LNU804    | pUC19c_LNU804     | foxtail_millet                    | 5062, 5215, 5131, 5292   | 340                       | 758                    |
| LNU805    | pQFNe_LNU805      | foxtail_millet                    | 5395, 4893, 5431, 4900   | 341                       | 550                    |
| LNU806    | pQFNe_LNU806      | foxtail_millet                    | 5401, 4940, 5376, 4975   | 342                       | 759                    |

TABLE 100-continued

| Gene Name | High copy plasmid   | Organism       | Primers used SEQ ID NOs: | Polynucleotide SEQ ID NO: | Polypeptide SEQ ID NO: |
|-----------|---------------------|----------------|--------------------------|---------------------------|------------------------|
| LNU807    | pUC19c_LNU807       | foxtail_millet | 4926, 4907, 4927, 4911   | 343                       | 552                    |
| LNU808    | pQFNc_LNU808        | foxtail_millet | 5124, 5366, 5099, 5221   | 344                       | 553                    |
| LNU809    | pQFNc_LNU809        | foxtail_millet | 5033, 5275, 5033, 5275   | 345                       | 760                    |
| LNU811    | pUC19c_LNU811       | maize          | 5021, 5259, 5021, 5259   | 346                       | 556                    |
| LNU813    | pQFNc_LNU813        | maize          | 5387, 4968, 5387, 4968   | 347                       | 557                    |
| LNU814    | pMA-RQ_LNU814_GA    |                |                          | 348                       | 558                    |
| LNU815    | pQFNc_LNU815        | maize          | 5115, 5334, 5158, 5335   | 349                       | 559                    |
| LNU816    | pUC19c_LNU816       | maize          | 4916, 4937, 4918, 4932   | 350                       | 761                    |
| LNU817    | pQFNc_LNU817        | maize          | 5135, 5244, 5135, 5244   | 351                       | 762                    |
| LNU818    | TopoB_LNU818        | maize          | 5369, 5077, 5372, 5138   | 352                       | 763                    |
| LNU819    | pQFNc_LNU819        | maize          | 5038, 5283, 5038, 5283   | 353                       | 563                    |
| LNU820    | pQFNc_LNU820        | maize          | 5150, 5249, 5150, 5249   | 354                       | 564                    |
| LNU821    | TopoB_LNU821        | maize          | 5393, 5104, 5393, 5104   | 355                       | 764                    |
| LNU822    | pMA-T_LNU822_GA     |                |                          | 356                       | 566                    |
| LNU823    | pQFNc_LNU823        | maize          | 5042, 5339, 5095, 5225   | 357                       | 567                    |
| LNU824    | pQFNc_LNU824        | maize          | 5051, 5361, 5051, 5361   | 358                       | 765                    |
| LNU825    | pQFNc_LNU825        | maize          | 5079, 5324, 5079, 5324   | 359                       | 766                    |
| LNU828    | pQFNc_LNU828        | maize          | 5426, 4981, 5426, 4981   | 360                       | 570                    |
| LNU829    | pQFNc_LNU829        | maize          | 5024, 5217, 5059, 5220   | 361                       | 767                    |
| LNU830    | TopoB_LNU830        | maize          | 5004, 4985, 5004, 4985   | 362                       | 572                    |
| LNU831    | pQFNc_LNU831        | maize          | 5118, 5226, 5142, 5224   | 363                       | 768                    |
| LNU832_H2 | pQFNc_LNU832_H2     | sorghum        | 5418, 5083, 5418, 5083   | 492                       | 709                    |
| LNU833    | pUC19c_LNU833       | maize          | 5110, 5250, 5025, 5223   | 364                       | 769                    |
| LNU834_H1 | pMA-RQ_LNU834_H1_GA |                |                          | 493                       | 710                    |
| LNU835    | pUC19c_LNU835       | maize          | 5384, 5189, 5394, 5199   | 365                       | 577                    |
| LNU837    | TopoB_LNU837        | maize          | 5040, 5260, 5040, 5260   | 366                       | 770                    |
| LNU838    | pQFNc_LNU838        | maize          | 5434, 4956, 5434, 4956   | 367                       | 579                    |
| LNU839    | pQFNc_LNU839        | maize          | 4931, 4966, 4931, 4966   | 368                       | 580                    |
| LNU840    | pQFNc_LNU840        | maize          | 5020, 5261, 5020, 5308   | 369                       | 581                    |
| LNU841    | pQFNc_LNU841        | maize          | 5197, 5435               | 370                       | 582                    |
| LNU843    | pUC19_LNU843        | maize          | 5022, 5009, 5022, 5005   | 371                       | 583                    |
| LNU844    | pQFNc_LNU844        | maize          | 4933, 4958, 4936, 4991   | 372                       | 584                    |
| LNU845    | TopoB_LNU845        | maize          | 5375, 4986, 5413, 4994   | 373                       | 771                    |
| LNU846    | pUC19c_LNU846       | maize          | 5058, 5286, 5162, 5269   | 374                       | 586                    |
| LNU847    | pUC19c_LNU847       | medicago       | 5430, 4905, 5419, 4910   | 375                       | 772                    |
| LNU848    | pQFNc_LNU848        | rice           | 5060, 5268, 5035, 5314   | 376                       | 588                    |
| LNU849    | pMA_LNU849_GA       |                |                          | 377                       | 589                    |
| LNU850    | pMA_LNU850_GA       |                |                          | 378                       | 590                    |
| LNU851    | pMA-RQ_LNU851_GA    |                |                          | 379                       | 591                    |
| LNU852    | pMK-RQ_LNU852_GA    |                |                          | 380                       | 592                    |
| LNU853    | TopoB_LNU853        | rice           | 4983, 4909, 4983, 4909   | 381                       | 593                    |
| LNU854    | pUC19c_LNU854       | rice           | 4935, 4973, 4938, 4979   | 382                       | 594                    |
| LNU856    | pUC19c_LNU856       | sorghum        | 5198, 5241, 5198, 5241   | 383                       | 595                    |
| LNU857    | pQFNc_LNU857        | sorghum        | 5070, 5350, 5070, 5208   | 384                       | 773                    |
| LNU858    | pUC19_LNU858        | sorghum        | 5427, 4964, 5427, 4964   | 385                       | 774                    |
| LNU859    | TopoB_LNU859        | sorghum        | 5417, 4999, 5417, 4999   | 495                       |                        |
| LNU861_H3 | pMA_LNU861_H3_GA    |                |                          | 494                       | 711                    |
| LNU862    | TopoB_LNU862        | sorghum        | 5422, 4957, 5406, 4970   | 386                       | 599                    |
| LNU864    | pQFNc_LNU864        | sorghum        | 5140, 5336, 5017, 5309   | 387                       | 600                    |
| LNU865    | pUC19c_LNU865       | sorghum        | 5181, 5346, 5181, 5346   | 388                       | 601                    |
| LNU866    | pQFNc_LNU866        | sorghum        | 5151, 5307, 5185, 5363   | 389                       | 775                    |
| LNU867    | pUC19c_LNU867       | sorghum        | 5045, 5353, 5045, 5353   | 390                       | 603                    |
| LNU868    | pQFNc_LNU868        | sorghum        | 5084, 5333, 5159, 5291   | 391                       | 604                    |
| LNU869    | pQFNc_LNU869        | sorghum        | 5170, 5272, 5170, 5289   | 392                       | 605                    |
| LNU870    | pUC19c_LNU870       | sorghum        | 5108, 5322, 5132, 5204   | 393                       | 606                    |
| LNU871    | pUC19c_LNU871       | sorghum        | 5404, 4955, 5404, 4955   | 394                       | 607                    |
| LNU872    | pQFNc_LNU872        | sorghum        | 5177, 5248, 5048, 5231   | 395                       | 608                    |
| LNU873    | pUC19_LNU873        | sorghum        | 4934, 4967, 4934, 4967   | 396                       | 609                    |
| LNU874    | TopoB_LNU874        | sorghum        | 5027, 5012, 5027, 5007   | 397                       | 610                    |
| LNU875    | pUC19c_LNU875       | sorghum        | 5423, 4945, 5386, 4995   | 398                       | 611                    |
| LNU876    | TopoB_LNU876        | sorghum        | 5178, 5263, 5136, 5213   | 399                       | 612                    |
| LNU878    | pQFNc_LNU878        | sorghum        | 5432, 5166, 5432, 5166   | 400                       | 613                    |
| LNU879    | pQFNc_LNU879        | sorghum        | 5112, 5288, 5112, 5288   | 401                       | 614                    |
| LNU880    | pUC19c_LNU880       | sorghum        | 5109, 5303, 5157, 5296   | 402                       | 615                    |
| LNU881    | pUC19c_LNU881       | sorghum        | 4915, 5105, 4917, 5106   | 403                       | 616                    |
| LNU882    | pUC19c_LNU882       | sorghum        | 4978, 4896, 4977, 4904   | 404                       | 617                    |
| LNU884    | pMA-RQ_LNU884_GA    |                |                          | 405                       | 619                    |
| LNU885    | pMA_LNU885_GA       |                |                          | 406                       | 620                    |
| LNU886    | pQFNc_LNU886        | sorghum        | 5011, 4939, 5008, 4925   | 407                       | 776                    |
| LNU887    | TopoB_LNU887        | sorghum        | 4924, 4982, 4924, 4982   | 408                       | 622                    |
| LNU888    | pQFNc_LNU888        | sorghum        | 5081, 5278, 5081, 5278   | 409                       | 623                    |
| LNU889    | pUC19c_LNU889       | sorghum        | 5411, 4961, 5411, 4961   | 410                       | 624                    |
| LNU890    | pUC19c_LNU890       | sorghum        | 5076, 5211, 5076, 5211   | 411                       | 625                    |
| LNU892    | pMA-RQ_LNU892_GA    |                |                          | 412                       | 626                    |
| LNU893    | pQFNc_LNU893        | sorghum        | 5036, 5277, 5030, 5277   | 413                       | 627                    |
| LNU894    | pUC19c_LNU894       | sorghum        | 5155, 5219, 5155, 5313   | 414                       | 628                    |

TABLE 100-continued

| Gene Name | High copy plasmid | Organism | Primers used SEQ ID NOs: | Polynucleotide SEQ ID NO: | Polypeptide SEQ ID NO: |
|-----------|-------------------|----------|--------------------------|---------------------------|------------------------|
| LNU895    | pQFNc_LNU895      | sorghum  | 5398, 5071, 5398, 5169   | 415                       | 629                    |
| LNU896    | pUC19_LNU896      | sorghum  | 5130, 5206, 5133, 5300   | 416                       | 630                    |
| LNU897    | pQFNc_LNU897      | sorghum  | 5037, 5210, 5032, 5229   | 417                       | 777                    |
| LNU898    | pUC19_LNU898      | sorghum  | 5176, 4950, 5128, 4992   | 418                       | 778                    |
| LNU899    | pUC19_LNU899      | sorghum  | 5195, 5348, 5113, 5355   | 419                       | 633                    |
| LNU900    | pQFNc_LNU900      | sorghum  | 5086, 5270, 5086, 5270   | 420                       | 779                    |
| LNU901    | TopoB_LNU901      | sorghum  | 5163, 5280               | 421                       | 780                    |
| LNU902    | pQFNc_LNU902      | sorghum  | 5129, 5311, 5167, 5264   | 422                       | 636                    |
| LNU903    | pMK-RQ_LNU903_GA  |          |                          | 423                       | 637                    |
| LNU904    | pUC19c_LNU904     | sorghum  | 5368, 5057, 5421, 5188   | 424                       | 781                    |
| LNU905    | pUC19c_LNU905     | sorghum  | 5029, 5235, 5091, 5319   | 425                       | 639                    |
| LNU906    | pQFNc_LNU906      | sorghum  | 5154, 5325, 5050, 5274   | 426                       | 782                    |
| LNU907    | pQFNc_LNU907      | sorghum  | 5377, 5360, 5377, 5360   | 427                       | 783                    |
| LNU908    | pQFNc_LNU908      | sorghum  | 5397, 5065, 5382, 5041   | 428                       | 642                    |
| LNU909    | pUC19c_LNU909     | sorghum  | 5424, 4998, 5407, 4941   | 429                       | 784                    |
| LNU910    | pQFNc_LNU910      | sorghum  | 5200, 5279, 5200, 5279   | 430                       | 644                    |
| LNU911    | pUC19_LNU911      | sorghum  | 5090, 5202, 5194, 5230   | 431                       | 785                    |
| LNU912    | pQFNc_LNU912      | sorghum  | 5187, 5327, 5074, 5299   | 432                       | 646                    |
| LNU913    | pUC19_LNU913      | sorghum  | 5156, 5015, 5196, 5014   | 433                       | 647                    |
| LNU914    | TopoB_LNU914      | sorghum  | 4914, 4919, 4920, 4921   | 434                       | 648                    |
| LNU915    | pUC19c_LNU915     | sorghum  | 5134, 5239, 5134, 5239   | 435                       | 649                    |
| LNU916    | TopoB_LNU916      | sorghum  | 5180, 5276, 5190, 5290   | 436                       | 650                    |
| LNU917    | pQFNc_LNU917      | sorghum  | 5168, 5347, 5121, 5233   | 437                       | 651                    |
| LNU918    | pUC19c_LNU918     | sorghum  | 5381, 4980, 5381, 4980   | 438                       | 652                    |
| LNU919    | pMA_LNU919_GA     |          |                          | 439                       | 653                    |
| LNU920    | pMA-RQ_LNU920_GA  |          |                          | 440                       | 654                    |
| LNU921    | pQFNc_LNU921      | sorghum  | 5094, 5222, 5193, 5256   | 441                       | 655                    |
| LNU922    | pMA-T_LNU922_GA   |          |                          | 442                       | 656                    |
| LNU923    | pQFNc_LNU923      | sorghum  | 5173, 5293, 5173, 5293   | 443                       | 657                    |
| LNU924    | pQFNc_LNU924      | sorghum  | 5049, 5365               | 444                       | 658                    |
| LNU925    | pUC19c_LNU925     | sorghum  | 5410, 5097, 5405, 5066   | 445                       | 659                    |
| LNU926    | pQFNc_LNU926      | sorghum  | 5145, 5301, 5145, 5320   | 446                       | 660                    |
| LNU928    | pUC19c_LNU928     | sorghum  | 5114, 5252, 5141, 5329   | 447                       | 661                    |
| LNU930    | pUC19c_LNU930     | sorghum  | 5039, 5251, 5089, 5209   | 448                       | 786                    |
| LNU931    | pMA_LNU931_GA     |          |                          | 449                       | 664                    |
| LNU932    | TopoB_LNU932      | sorghum  | 5117, 5255, 5117, 5255   | 450                       | 787                    |
| LNU933    | pQFNc_LNU933      | sorghum  | 5379, 5046, 5433, 5191   | 451                       | 666                    |
| LNU934    | pOA_LNU934_GA     |          |                          | 452                       | 667                    |
| LNU935    | pQFNc_LNU935      | sorghum  | 5152, 5267, 5152, 5267   | 453                       | 788                    |
| LNU936    | pMA-RQ_LNU936_GA  |          |                          | 454                       | 669                    |
| LNU938    | pQFNc_LNU938      | sorghum  | 5072, 5284, 5047, 5265   | 455                       | 789                    |
| LNU940    | pQFNc_LNU940      | sorghum  | 5161, 5254, 5161, 5254   | 456                       | 672                    |
| LNU941    | pQFNc_LNU941      | sorghum  | 5031, 5323, 5031, 5323   | 457                       | 673                    |
| LNU942    | pQFNc_LNU942      | sorghum  | 5054, 5258               | 458                       | 674                    |
| LNU943    | pQFNc_LNU943      | sorghum  | 5388, 4948, 5385, 4944   | 459                       | 675                    |
| LNU944    | pUC19_LNU944      | sorghum  | 5100, 5294, 5100, 5342   | 460                       | 676                    |
| LNU945    | pMA-RQ_LNU945_GA  |          |                          | 461                       | 677                    |
| LNU946    | pUC19_LNU946      | sorghum  | 4984, 4908, 4959, 4901   | 462                       | 678                    |
| LNU947    | pQFNc_LNU947      | sorghum  | 5370, 4946, 5370, 4946   | 463                       | 679                    |
| LNU948    | pUC19c_LNU948     | sorghum  | 5120, 5306, 5127, 5216   | 464                       | 680                    |
| LNU949    | pMA-RQ_LNU949_GA  |          |                          | 465                       | 681                    |
| LNU950    | pUC19c_LNU950     | sorghum  | 5116, 5312, 5116, 5312   | 466                       | 682                    |
| LNU951    | pQFNc_LNU951      | sorghum  | 4922, 4951, 4922, 4951   | 467                       | 790                    |
| LNU952    | pUC19c_LNU952     | sorghum  | 5380, 4997, 5378, 4947   | 468                       | 684                    |
| LNU953    | pUC19c_LNU953     | sorghum  | 5078, 5247, 5078, 5207   | 469                       | 685                    |
| LNU954    | pQFNc_LNU954      | sorghum  | 5139, 5340, 5044, 5298   | 470                       | 791                    |
| LNU955    | pMA_LNU955_GA     |          |                          | 471                       | 687                    |
| LNU956    | pQFNc_LNU956      | sorghum  | 5429, 4993, 5425, 4952   | 472                       | 792                    |
| LNU957    | pMK-RQ_LNU957_GA  |          |                          | 473                       | 689                    |
| LNU958    | pQFNc_LNU958      | sorghum  | 5122, 5295, 5122, 5295   | 474                       | 690                    |
| LNU959    | pUC19c_LNU959     | sorghum  | 5172, 5297               | 475                       | 691                    |
| LNU960    | pUC19_LNU960      | sorghum  | 5147, 5304, 5034, 5331   | 476                       | 692                    |
| LNU961    | pOA_LNU961_GA     |          |                          | 477                       | 693                    |
| LNU962    | pUC19_LNU962      | sorghum  | 4988, 4894, 4990, 4903   | 478                       | 694                    |
| LNU963    | pUC19c_LNU963     | sorghum  | 5420, 4942, 5408, 4963   | 479                       | 695                    |
| LNU964    | pMA-RQ_LNU964_GA  |          |                          | 480                       | 696                    |
| LNU965    | pQFNc_LNU965      | sorghum  | 5102, 5302               | 481                       | 697                    |
| LNU966    | TopoB_LNU966      | sorghum  | 5068, 5328, 5192, 5330   | 482                       | 698                    |
| LNU967    | pUC19_LNU967      | sorghum  | 5399, 4953, 5374, 4969   | 483                       | 699                    |
| LNU968    | pQFNc_LNU968      | sorghum  | 5093, 5315               | 484                       | 793                    |
| LNU970    | pMA-T_LNU970_GA   |          |                          | 485                       | 702                    |
| LNU971    | pMA-T_LNU971_GA   |          |                          | 486                       | 703                    |
| LNU972    | TopoB_LNU972      | tomato   | 5171, 5305, 5126, 5318   | 487                       | 704                    |

TABLE 100-continued

| Gene Name | High copy plasmid | Organism | Primers used SEQ ID NOs: | Polynucleotide SEQ ID NO: | Polypeptide SEQ ID NO: |
|-----------|-------------------|----------|--------------------------|---------------------------|------------------------|
| LNU975    | pQFNc_LNU975      | tomato   | 5064, 5367, 5016, 5271   | 488                       | 705                    |
| LNU976    | pQFNc_LNU976      | wheat    | 5053, 5341, 5179, 5352   | 489                       | 706                    |
| LNU977    | pQFNc_LNU977      | wheat    | 5281, 5364, 5281, 5317   | 490                       | 794                    |

Table 100. Provided are the names of the cloned genes, the high copy plasmids, the organism from which the gene was cloned, the primers used for cloning, and the sequence identifiers of the polynucleotides and polypeptides of the cloned genes.

### Example 13

#### Transforming *Agrobacterium tumefaciens* Cells with Binary Vectors Harboring the Polynucleotides of the Invention

The above described binary vectors were used to transform *Agrobacterium* cells. Two additional binary constructs, having only the At6669 or the 35S promoter, or no additional promoter were used as negative controls.

The binary vectors were introduced to *Agrobacterium tumefaciens* GV301 or LB4404 (for *Arabidopsis*) or to AGL1 (for *Brachypodium*) competent cells (about 10<sup>9</sup> cells/mL) by electroporation. The electroporation was performed using a MicroPulser electroporator (Biorad), 0.2 cm cuvettes (Biorad) and EC-2 electroporation program (Biorad). The treated cells were cultured in LB liquid medium at 28° C. for 3 hours, then plated over LB agar supplemented with gentamycin (for *Arabidopsis*; 50 mg/L; for *Agrobacterium* strains GV301) or streptomycin (for *Arabidopsis*; 300 mg/L; for *Agrobacterium* strain LB4404); or with Carbenicillin (for *Brachypodium*; 50 mg/L) and kanamycin (for *Arabidopsis* and *Brachypodium*; 50 mg/L) at 28° C. for 48 hours. *Agrobacterium* colonies, which were developed on the selective media, were further analyzed by PCR using the primers designed to span the inserted sequence in the pPI plasmid. The resulting PCR products were isolated and sequenced to verify that the correct polynucleotide sequences of the invention are properly introduced to the *Agrobacterium* cells.

### Example 14

#### Transformation of *Arabidopsis thaliana* Plants with the Polynucleotides of the Invention

*Arabidopsis thaliana* Columbia plants (T<sub>0</sub> plants) were transformed using the Floral Dip procedure described by Clough and Bent, 1998 (Floral dip: a simplified method for *Agrobacterium*-mediated transformation of *Arabidopsis thaliana*. Plant J 16:735-43) and by Desfeux et al., 2000 (Female Reproductive Tissues Are the Primary Target of *Agrobacterium*-Mediated Transformation by the *Arabidopsis* Floral-Dip Method. Plant Physiol, July 2000, Vol. 123, pp. 895-904), with minor modifications. Briefly, T<sub>0</sub> Plants were sown in 250 ml pots filled with wet peat-based growth mix. The pots were covered with aluminum foil and a plastic dome, kept at 4° C. for 3-4 days, then uncovered and incubated in a growth chamber at 18-24° C. under 16/8 hour light/dark cycles. The T<sub>0</sub> plants were ready for transformation six days before anthesis.

Single colonies of *Agrobacterium* carrying the binary constructs were generated as described in Examples 12-13 above. Colonies were cultured in LB medium supplemented with kanamycin (50 mg/L) and gentamycin (50 mg/L). The cultures were incubated at 28° C. for 48 hours under

vigorous shaking and then centrifuged at 4000 rpm for 5 minutes. The pellets comprising the *Agrobacterium* cells were re-suspended in a transformation medium containing half-strength (2.15 g/L) Murashige-Skoog (Duchefa); 0.044 μM benzylamino purine (Sigma); 112 μg/L B5 Gambourg vitamins (Sigma); 5% sucrose; and 0.2 ml/L Silwet L-77 (OSI Specialists, CT) in double-distilled water, at pH of 5.7.

Transformation of T<sub>0</sub> plants was performed by inverting each plant into an *Agrobacterium* suspension, such that the above ground plant tissue was submerged for 3-5 seconds. Each inoculated T<sub>0</sub> plant was immediately placed in a plastic tray, then covered with clear plastic dome to maintain humidity and is kept in the dark at room temperature for 18 hours, to facilitate infection and transformation. Transformed (transgenic) plants were then uncovered and transferred to a greenhouse for recovery and maturation. The transgenic T<sub>0</sub> plants were grown in the greenhouse for 3-5 weeks until siliques were brown and dry. Seeds were harvested from plants and kept at room temperature until sowing.

For generating T<sub>1</sub> and T<sub>2</sub> transgenic plants harboring the genes, seeds collected from transgenic T<sub>0</sub> plants were surface-sterilized by soaking in 70% ethanol for 1 minute, followed by soaking in 5% sodium hypochloride and 0.05% triton for 5 minutes. The surface-sterilized seeds were thoroughly washed in sterile distilled water then placed on culture plates containing half-strength Murashige-Skoog (Duchefa); 2% sucrose; 0.8% plant agar; 50 mM kanamycin; and 200 mM carbenicillin (Duchefa). The culture plates were incubated at 4° C. for 48 hours, then transferred to a growth room at 25° C. for an additional week of incubation. Vital T<sub>1</sub> *Arabidopsis* plants were transferred to fresh culture plates for another week of incubation. Following incubation the T<sub>1</sub> plants were removed from culture plates and planted in growth mix contained in 250 ml pots. The transgenic plants were allowed to grow in a greenhouse to maturity. Seeds harvested from T<sub>1</sub> plants were cultured and grown to maturity as T<sub>2</sub> plants under the same conditions as used for culturing and growing the T<sub>1</sub> plants.

### Example 15

#### Transformation of *Brachypodium distachyon* Plants with the Polynucleotides of the Invention

Similar to the *Arabidopsis* model plant, *Brachypodium distachyon* has several features that recommend it as a model plant for functional genomic studies, especially in the grasses. Traits that make it an ideal model include its small genome (~160 Mbp for a diploid genome and 355 Mbp for a polyploidy genome), small physical stature, a short life-cycle, and few growth requirements. *Brachypodium* is related to the major cereal grain species but it is understood to be more closely related to the Triticeae (wheat, barley) than to the other cereals. *Brachypodium*, with its polyploidy accessions, can serve as an ideal model for these grasses

(whose genomics size and complexity is a major barrier to biotechnological improvement).

*Brachypodium distachyon* embryogenic calli were transformed using the procedure described by Vogel and Hill (2008) [High-efficiency *Agrobacterium*-mediated transformation of *Brachypodium distachyon* inbred line Bd21-3. Plant Cell Rep 27:471-478], Vain et al (2008) [*Agrobacterium*-mediated transformation of the temperate grass *Brachypodium distachyon* (genotype Bd21) for T-DNA insertional mutagenesis. Plant Biotechnology J 6: 236-245], and Vogel J, et al. (2006) [*Agrobacterium* mediated transformation and inbred line development in the model grass *Brachypodium distachyon*. Plant Cell Tiss Org. Cult. 85:199-211], each of which is fully incorporated herein by reference, with some minor modifications, which are briefly summarized hereinbelow.

Callus initiation—Immature spikes (about 2 months after seeding) were harvested at the very beginning of seeds filling. Spikes were then husked and surface sterilized with 3% NaClO containing 0.1% Tween 20, shaken on a gyratory shaker at low speed for 20 minutes. Following three rinses with sterile distilled water, embryos were excised under a dissecting microscope in a laminar flow hood using fine forceps.

Excised embryos (size ~0.3 mm, bell shaped) were placed on callus induction medium (CIM) [LS salts (Linsmaier, E. M. & Skoog, F. 1965. Physiol. Plantarum 18, 100) and vitamins plus 3% sucrose, 6 mg/L CuSO<sub>4</sub>, 2.5 mg/l 2,4-Dichlorophenoxyacetic Acid, pH 5.8 and 0.25% phytigel (Sigma)] scutellar side down, 100 embryos on a plate, and incubated at 28° C. in the dark. One week later, the embryonic calli was cleaned from emerging roots, shoots and somatic calli, and was subcultured onto fresh CIM medium. During culture, yellowish embryogenic callus (EC) appeared and were further selected (e.g., picked and transferred) for further incubation in the same conditions for additional 2 weeks. Twenty-five pieces of sub-cultured calli were then separately placed on 90×15 mm petri plates, and incubated as before for three additional weeks.

Transformation—As described in Vogel and Hill (2008, Supra), *Agrobacterium* was scraped off 2-day-old MGL plates (plates with the MGL medium which contains: Tryptone 5 g/l, Yeast Extract 2.5 g/l, NaCl 5 g/l, D-Mannitol 5 g/l, MgSO<sub>4</sub>\*7H<sub>2</sub>O 0.204 g/l, K<sub>2</sub>HPO<sub>4</sub> 0.25 g/l, Glutamic Acid 1.2 g/l, Plant Agar 7.5 g/l) and resuspended in liquid MS medium supplemented with 200 μM acetosyringone to an optic density (OD) at 600 nm (OD<sub>600</sub>) of 0.6. Once the desired OD was attained, 1 ml of 10% Synperonic PE/F68 (Sigma) per 100 ml of inoculation medium was added.

To begin inoculation, 300 callus pieces were placed in approximately 12 plates (25 callus pieces in each plate) and covered with the *Agrobacterium* suspension (8-8.5 ml). The callus was incubated in the *Agrobacterium* suspension for 15 minutes with occasional gentle rocking. After incubation, the *Agrobacterium* suspension was aspirated off and the calli were then transferred into co-cultivation plates, prepared by placing a sterile 7-cm diameter filter paper in an empty 90×15 mm petri plate. The calli pieces were then gently distributed on the filter paper. One co-cultivation plate was used for two starting callus plates (50 initial calli pieces). The co-cultivation plates were then sealed with parafilm and incubated at 22° C. in the dark for 3 days. The callus pieces were then individually transferred onto CIM medium as described above, which was further supplemented with 200 mg/l Ticarcillin (to kill the *Agrobacterium*) and Bialaphos (5

mg/L) (for selection of the transformed resistant embryogenic calli sections), and incubated at 28° C. in the dark for 14 days.

The calli pieces were then transferred to shoot induction media (SIM; LS salts and vitamins plus 3% Maltose monohydrate) supplemented with 200 mg/l Ticarcillin, Bialaphos (5 mg/L), Indol-3-acetic acid (IAA) (0.25 mg/L), and 6-Benzylaminopurine (BAP) (1 mg/L), and were sub-cultured in light to the same media after 10 days (total of 20 days). At each sub-culture all the pieces from a single callus were kept together to maintain their independence and were incubated under the following conditions: lighting to a level of 60 IE m<sup>-2</sup> s<sup>-1</sup>, a 16-h light, 8-h dark photoperiod and a constant 24° C. temperature. Plantlets emerged from the transformed calli.

When plantlets were large enough to handle without damage, they were transferred to plates containing the above mentioned shoot induction media (SIM) without Bialaphos. Each plantlet was considered as a different event. The plantlets grew axillary tillers and eventually became bushy. Each bush from the same plant (event ID) was then divided to tissue culture boxes ("Humus") containing "rooting medium" [MS basal salts, 3% sucrose, 3 g/L phytigel, 2 mg/l α-Naphthalene Acetic Acid (NAA) and 1 mg/L IAA and Ticarcillin 200 mg/L, PH 5.8). All plants in a "Humus box" were different plants of the same transformation event.

When plantlets established roots they were transplanted to soil and transferred to a greenhouse. To verify the transgenic status of plants containing the other constructs, T0 plants were subjected to PCR as previously described by Vogel et al. 2006 [*Agrobacterium* mediated transformation and inbred line development in the model grass *Brachypodium distachyon*. Plant Cell Tiss Org. Cult. 85:199-211].

#### Example 16

##### Evaluating Transgenic *Arabidopsis* NUE Under Low or Normal Nitrogen Conditions Using Seedling Assays

##### Assay 1: Plant Growth Under Low and Favorable Nitrogen Concentration Levels

Surface sterilized seeds were sown in basal media [50% Murashige-Skoog medium (MS) supplemented with 0.8% plant agar as solidifying agent] in the presence of Kanamycin (used as a selecting agent). After sowing, plates were transferred for 2-3 days for stratification at 4° C. and then grown at 25° C. under 12-hour light 12-hour dark daily cycles for 7 to 10 days. At this time point, seedlings randomly chosen were carefully transferred to plates containing ½ MS media (15 mM N) for the normal nitrogen concentration treatment and 0.30 mM nitrogen for the low nitrogen concentration treatments. For experiments performed in T<sub>2</sub> lines, each plate contained 5 seedlings of the same transgenic event, and 3-4 different plates (replicates) for each event. For each polynucleotide of the invention at least four-five independent transformation events were analyzed from each construct. For experiments performed in T<sub>1</sub> lines, each plate contained 5 seedlings of 5 independent transgenic events and 3-4 different plates (replicates) were planted. In total, for T<sub>1</sub> lines, 20 independent events were evaluated. Plants expressing the polynucleotides of the invention were compared to the average measurement of the control plants (empty vector or GUS reporter gene under the same promoter) used in the same experiment.

Digital imaging—A laboratory image acquisition system, which consists of a digital reflex camera (Canon EOS 300D)

attached with a 55 mm focal length lens (Canon EF-S series), mounted on a reproduction device (Kaiser RS), which includes 4 light units (4×150 Watts light bulb) and located in a darkroom, is used for capturing images of plantlets seen in agar plates.

The image capturing process was repeated every 3-4 days starting at day 1 till day 10 (see for example the images in FIGS. 3A-B). An image analysis system was used, which consists of a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.39 [Java based image processing program which was developed at the U.S. National Institutes of Health and freely available on the internet at rsbweb (dot) nih (dot) gov/]. Images are captured in resolution of 10 Mega Pixels (3888×2592 pixels) and stored in a low compression JPEG (Joint Photographic Experts Group standard) format. Next, analyzed data was saved to text files and processed using the JMP statistical analysis software (SAS institute).

Seedling analysis—Using the digital analysis seedling data was calculated, including leaf area, root coverage and root length.

The relative growth rate for the various seedling parameters was calculated according to the following Formulas XIII (Relative growth rate of leaf area) and VI (Relative growth rate of root length).

At the end of the experiment, plantlets were removed from the media and weighed for the determination of plant fresh weight. Plantlets were then dried for 24 hours at 60° C., and weighed again to measure plant dry weight for later statistical analysis. Growth rate was determined by comparing the leaf area coverage, root coverage and root length, between each couple of sequential photographs, and results were used to resolve the effect of the gene introduced on plant vigor under optimal conditions. Similarly, the effect of the gene introduced on biomass accumulation, under optimal conditions, was determined by comparing the plants' fresh and dry weight to that of control plants (containing an empty vector or the GUS reporter gene under the same promoter). From every construct created, 3-5 independent transformation events are examined in replicates.

Statistical analyses—To identify genes conferring significantly improved plant vigor or enlarged root architecture, the results obtained from the transgenic plants were compared to those obtained from control plants. To identify outperforming genes and constructs, results from the independent transformation events tested were analyzed separately. To evaluate the effect of a gene event over a control the data was analyzed by Student's t-test and the p value was calculated. Results were considered significant if  $p \leq 0.1$ . The JMP statistics software package was used (Version 5.2.1, SAS Institute Inc., Cary, N.C., USA).

#### Experimental Results:

The genes presented in the following Tables were cloned under the regulation of a constitutive promoter (At6669). Evaluation of the effect of transformation in a plant of each gene was carried out by testing the performance of different number of transformation events. Some of the genes were evaluated in more than one seedling assay. The results obtained in these second experiments were significantly positive as well. Event with p-value  $< 0.1$  was considered statistically significant.

The genes presented in Tables 101-104 showed a significant improvement in plant NUE since they produced larger plant biomass (plant fresh and dry weight; leaf area, root length and root coverage) in T2 generation (Tables 101-102) or T1 generation (Tables 103-104) when grown under limiting nitrogen growth conditions, compared to control plants

that were grown under identical growth conditions. Plants producing larger root biomass have better possibilities to absorb larger amount of nitrogen from soil.

TABLE 101

| Genes showing improved plant performance at nitrogen deficient conditions (T2 generation) |         |                 |        |            |                   |        |            |  |
|-------------------------------------------------------------------------------------------|---------|-----------------|--------|------------|-------------------|--------|------------|--|
| Gene Name                                                                                 | Event # | Dry Weight [mg] |        |            | Fresh Weight [mg] |        |            |  |
|                                                                                           |         | Ave.            | P-Val. | %<br>Incr. | Ave.              | P-Val. | %<br>Incr. |  |
| LNU938                                                                                    | 80352.1 | 5.65            | L      | 46         | 117.0             | 0.24   | 68         |  |
| LNU938                                                                                    | 80353.1 | —               | —      | —          | 103.8             | 0.04   | 49         |  |
| LNU938                                                                                    | 80355.5 | 5.40            | 0.18   | 40         | 90.1              | 0.22   | 29         |  |
| LNU910                                                                                    | 80350.1 | 5.03            | 0.17   | 30         | 103.2             | 0.09   | 48         |  |
| LNU869                                                                                    | 80083.3 | 5.75            | L      | 49         | 86.0              | 0.21   | 23         |  |
| LNU869                                                                                    | 80084.4 | 5.35            | 0.10   | 39         | —                 | —      | —          |  |
| LNU869                                                                                    | 80085.2 | 4.62            | 0.27   | 20         | —                 | —      | —          |  |
| LNU869                                                                                    | 80085.3 | 5.15            | 0.03   | 34         | 85.8              | 0.23   | 23         |  |
| LNU840                                                                                    | 78676.4 | —               | —      | —          | 84.8              | 0.26   | 22         |  |
| LNU837                                                                                    | 79574.5 | 4.60            | 0.26   | 19         | —                 | —      | —          |  |
| LNU837                                                                                    | 79574.7 | 4.98            | 0.04   | 29         | 91.5              | 0.17   | 31         |  |
| LNU771                                                                                    | 80077.2 | 5.28            | 0.02   | 37         | 85.8              | 0.06   | 23         |  |
| LNU771                                                                                    | 80079.3 | —               | —      | —          | 103.7             | 0.14   | 49         |  |
| CONT.                                                                                     | —       | 3.86            | —      | —          | 69.7              | —      | —          |  |
| LNU964                                                                                    | 80552.4 | 4.77            | 0.04   | 14         | 94.8              | 0.29   | 19         |  |
| LNU964                                                                                    | 80552.6 | 5.05            | 0.01   | 20         | 103.2             | 0.06   | 30         |  |
| LNU957                                                                                    | 80437.1 | 5.95            | L      | 42         | 95.0              | 0.14   | 20         |  |
| LNU957                                                                                    | 80437.6 | 5.28            | 0.29   | 26         | 99.7              | 0.05   | 26         |  |
| LNU953                                                                                    | 80428.1 | 5.62            | 0.05   | 34         | 115.3             | 0.15   | 45         |  |
| LNU952                                                                                    | 78218.3 | —               | —      | —          | 104.1             | 0.14   | 31         |  |
| LNU920                                                                                    | 78510.1 | 5.40            | 0.08   | 29         | 105.0             | L      | 32         |  |
| LNU914                                                                                    | 80514.5 | 5.50            | 0.02   | 31         | 86.1              | 0.14   | 8          |  |
| LNU911                                                                                    | 80420.5 | —               | —      | —          | 98.4              | 0.29   | 24         |  |
| LNU911                                                                                    | 80424.2 | 5.15            | 0.03   | 23         | 127.8             | 0.09   | 61         |  |
| LNU903                                                                                    | 80417.6 | —               | —      | —          | 98.2              | 0.01   | 24         |  |
| LNU901                                                                                    | 80474.5 | 4.62            | 0.28   | 10         | —                 | —      | —          |  |
| LNU901                                                                                    | 80476.4 | 4.85            | 0.18   | 15         | —                 | —      | —          |  |
| LNU897                                                                                    | 80448.3 | 5.40            | 0.20   | 29         | 99.0              | 0.03   | 25         |  |
| LNU897                                                                                    | 80449.1 | 4.70            | 0.10   | 12         | —                 | —      | —          |  |
| LNU892                                                                                    | 80410.1 | —               | —      | —          | 98.8              | 0.10   | 24         |  |
| LNU892                                                                                    | 80412.1 | 4.85            | 0.13   | 15         | 96.0              | 0.17   | 21         |  |
| LNU884                                                                                    | 80407.1 | 6.17            | 0.02   | 47         | 116.2             | L      | 46         |  |
| LNU884                                                                                    | 80407.5 | 4.88            | 0.22   | 16         | —                 | —      | —          |  |
| LNU872                                                                                    | 77724.7 | 5.15            | 0.13   | 23         | 99.7              | L      | 26         |  |
| LNU872                                                                                    | 77725.4 | 5.10            | 0.11   | 21         | 90.4              | 0.05   | 14         |  |
| LNU869                                                                                    | 80084.3 | 5.30            | L      | 26         | 93.6              | 0.05   | 18         |  |
| LNU869                                                                                    | 80084.4 | 5.53            | 0.02   | 32         | 114.5             | L      | 44         |  |
| LNU866                                                                                    | 80443.5 | 5.17            | 0.09   | 23         | —                 | —      | —          |  |
| LNU866                                                                                    | 80444.2 | 5.07            | 0.09   | 21         | —                 | —      | —          |  |
| LNU844                                                                                    | 80342.1 | 4.55            | 0.17   | 8          | —                 | —      | —          |  |
| LNU844                                                                                    | 80344.2 | 5.05            | 0.21   | 20         | 95.6              | 0.12   | 20         |  |
| LNU834_H1                                                                                 | 80402.7 | 5.38            | 0.17   | 28         | 112.4             | 0.08   | 42         |  |
| LNU791                                                                                    | 77893.1 | 5.05            | 0.08   | 20         | —                 | —      | —          |  |
| LNU749                                                                                    | 80793.5 | —               | —      | —          | 95.5              | 0.21   | 20         |  |
| CONT.                                                                                     | —       | 4.20            | —      | —          | 79.4              | —      | —          |  |
| LNU975                                                                                    | 80622.1 | 5.33            | 0.02   | 27         | —                 | —      | —          |  |
| LNU975                                                                                    | 80624.3 | 5.00            | 0.07   | 19         | —                 | —      | —          |  |
| LNU819                                                                                    | 78133.3 | 5.53            | 0.02   | 32         | 89.4              | 0.11   | 12         |  |
| LNU817                                                                                    | 80596.2 | 4.68            | 0.19   | 12         | —                 | —      | —          |  |
| LNU801                                                                                    | 78584.7 | 4.93            | 0.04   | 18         | —                 | —      | —          |  |
| LNU800                                                                                    | 77896.2 | 6.38            | L      | 52         | 127.4             | 0.22   | 60         |  |
| LNU794                                                                                    | 78522.1 | 5.22            | 0.08   | 25         | —                 | —      | —          |  |
| LNU760_H1                                                                                 | 80127.4 | 4.88            | 0.12   | 16         | 87.1              | 0.16   | 9          |  |
| CONT.                                                                                     | —       | 4.19            | —      | —          | 79.9              | —      | —          |  |
| LNU971                                                                                    | 78395.1 | —               | —      | —          | 92.1              | 0.13   | 32         |  |
| LNU971                                                                                    | 78395.5 | —               | —      | —          | 94.8              | 0.21   | 36         |  |
| LNU944                                                                                    | 79779.3 | 4.07            | 0.27   | 14         | —                 | —      | —          |  |
| LNU944                                                                                    | 79781.6 | —               | —      | —          | 98.0              | 0.11   | 41         |  |
| LNU931                                                                                    | 79774.5 | 3.92            | 0.28   | 10         | —                 | —      | —          |  |
| LNU930                                                                                    | 79770.5 | 4.88            | 0.03   | 36         | —                 | —      | —          |  |
| LNU930                                                                                    | 79772.1 | 3.98            | 0.11   | 11         | —                 | —      | —          |  |
| LNU928                                                                                    | 78211.4 | 4.50            | 0.16   | 26         | 94.9              | 0.18   | 36         |  |
| LNU928                                                                                    | 78215.4 | 4.28            | 0.03   | 19         | —                 | —      | —          |  |
| LNU917                                                                                    | 77498.2 | 4.42            | 0.09   | 24         | 88.8              | 0.24   | 28         |  |
| LNU917                                                                                    | 77500.1 | 4.55            | 0.01   | 27         | —                 | —      | —          |  |
| LNU906                                                                                    | 79219.6 | —               | —      | —          | 87.2              | 0.17   | 25         |  |
| LNU904                                                                                    | 78987.1 | —               | —      | —          | 115.6             | 0.29   | 66         |  |

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TABLE 101-continued

| Genes showing improved plant performance at nitrogen deficient conditions (T2 generation) |         |                 |        |         |                   |        |         |
|-------------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|
| Gene Name                                                                                 | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         |
|                                                                                           |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |
| LNU904                                                                                    | 78987.2 | 4.33            | 0.01   | 21      | —                 | —      | —       |
| LNU874                                                                                    | 78369.1 | —               | —      | —       | 85.5              | 0.12   | 23      |
| LNU870                                                                                    | 78501.1 | 4.53            | 0.01   | 26      | —                 | —      | —       |
| LNU870                                                                                    | 78505.1 | 4.12            | 0.06   | 15      | 104.9             | 0.11   | 51      |
| LNU870                                                                                    | 78505.7 | 4.22            | 0.14   | 18      | 97.9              | 0.29   | 41      |
| LNU867                                                                                    | 79589.3 | 4.40            | 0.03   | 23      | —                 | —      | —       |
| LNU862                                                                                    | 79757.1 | 4.45            | 0.08   | 24      | 76.6              | 0.22   | 10      |
| LNU856                                                                                    | 79753.3 | —               | —      | —       | 80.9              | 0.14   | 16      |
| LNU856                                                                                    | 79753.5 | 4.65            | 0.21   | 30      | 97.0              | 0.20   | 39      |
| LNU829                                                                                    | 77912.5 | 4.38            | 0.11   | 22      | 114.0             | 0.26   | 64      |
| LNU825                                                                                    | 77716.4 | 4.03            | 0.20   | 13      | —                 | —      | —       |
| LNU796                                                                                    | 78235.7 | 4.35            | 0.27   | 22      | —                 | —      | —       |
| LNU792                                                                                    | 79161.2 | 4.33            | L      | 21      | —                 | —      | —       |
| LNU792                                                                                    | 79215.1 | 4.15            | 0.14   | 16      | —                 | —      | —       |
| LNU763                                                                                    | 77588.7 | —               | —      | —       | 97.1              | 0.26   | 39      |
| LNU758                                                                                    | 79739.5 | 4.00            | 0.18   | 12      | —                 | —      | —       |
| LNU758                                                                                    | 79740.3 | —               | —      | —       | 99.3              | 0.29   | 43      |
| CONT.                                                                                     | —       | 3.58            | —      | —       | 69.6              | —      | —       |
| LNU955                                                                                    | 80432.7 | 5.25            | 0.02   | 35      | —                 | —      | —       |
| LNU953                                                                                    | 80428.1 | —               | —      | —       | 84.9              | 0.17   | 25      |
| LNU949                                                                                    | 80557.1 | —               | —      | —       | 83.8              | 0.05   | 24      |
| LNU949                                                                                    | 80557.4 | —               | —      | —       | 77.9              | 0.23   | 15      |

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TABLE 101-continued

| Genes showing improved plant performance at nitrogen deficient conditions (T2 generation) |         |                 |        |         |                   |        |         |
|-------------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|
| Gene Name                                                                                 | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         |
|                                                                                           |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |
| LNU901                                                                                    | 80474.2 | 4.70            | 0.16   | 21      | 86.9              | 0.20   | 28      |
| LNU901                                                                                    | 80474.3 | 4.70            | 0.09   | 21      | 98.7              | 0.04   | 46      |
| LNU901                                                                                    | 80476.4 | 4.33            | 0.29   | 11      | —                 | —      | —       |
| LNU892                                                                                    | 80414.5 | —               | —      | —       | 80.2              | 0.25   | 19      |
| LNU866                                                                                    | 80444.6 | 4.47            | 0.21   | 15      | 87.8              | 0.11   | 30      |
| LNU843                                                                                    | 78963.5 | —               | —      | —       | 79.5              | 0.27   | 17      |
| LNU834_H1                                                                                 | 80402.3 | —               | —      | —       | 80.6              | 0.12   | 19      |
| LNU834_H1                                                                                 | 80402.7 | —               | —      | —       | 75.9              | 0.24   | 12      |
| LNU798                                                                                    | 79671.4 | —               | —      | —       | 86.8              | 0.20   | 28      |
| LNU798                                                                                    | 79673.2 | —               | —      | —       | 80.9              | 0.24   | 20      |
| LNU787                                                                                    | 80547.5 | 4.97            | 0.12   | 27      | 93.0              | L      | 37      |
| LNU766                                                                                    | 78932.1 | 4.60            | 0.04   | 18      | 100.7             | 0.13   | 49      |
| CONT.                                                                                     | —       | 3.90            | —      | —       | 67.7              | —      | —       |
| LNU844                                                                                    | 80344.2 | —               | —      | —       | 94.6              | 0.13   | 18      |
| CONT.                                                                                     | —       | —               | —      | —       | 80.2              | —      | —       |

Table 101:  
 "CONT."—Control;  
 "Ave."—Average;  
 "% Incr." = % increment;  
 "p-val."—p-value;  
 L means that p-value is less than 0.01, p < 0.1 was considered as significant.

TABLE 102

| Genes showing improved plant performance at nitrogen deficient conditions (T2 generation) |         |                              |        |         |                                   |        |         |                   |        |         |
|-------------------------------------------------------------------------------------------|---------|------------------------------|--------|---------|-----------------------------------|--------|---------|-------------------|--------|---------|
| Gene Name                                                                                 | Event # | Leaf Area [cm <sup>2</sup> ] |        |         | Roots Coverage [cm <sup>2</sup> ] |        |         | Roots Length [cm] |        |         |
|                                                                                           |         | Ave.                         | P-Val. | % Incr. | Ave.                              | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |
| LNU954                                                                                    | 80358.5 | 0.434                        | 0.02   | 21      | 10.8                              | 0.06   | 40      | 7.19              | L      | 16      |
| LNU938                                                                                    | 80352.1 | —                            | —      | —       | 12.4                              | L      | 60      | 6.92              | 0.02   | 12      |
| LNU938                                                                                    | 80353.1 | 0.440                        | L      | 22      | 10.2                              | 0.01   | 32      | 7.48              | L      | 21      |
| LNU938                                                                                    | 80355.5 | 0.400                        | 0.18   | 11      | 12.8                              | 0.25   | 66      | 7.22              | 0.05   | 17      |
| LNU910                                                                                    | 80346.1 | —                            | —      | —       | —                                 | —      | —       | 6.80              | 0.28   | 10      |
| LNU910                                                                                    | 80348.1 | 0.403                        | 0.08   | 12      | —                                 | —      | —       | 6.82              | 0.04   | 11      |
| LNU910                                                                                    | 80350.1 | 0.461                        | 0.02   | 28      | 11.3                              | 0.09   | 47      | 7.18              | L      | 16      |
| LNU869                                                                                    | 80083.3 | —                            | —      | —       | 13.0                              | 0.16   | 69      | 7.16              | L      | 16      |
| LNU869                                                                                    | 80084.3 | 0.424                        | 0.09   | 18      | 10.3                              | L      | 33      | 6.55              | 0.23   | 6       |
| LNU869                                                                                    | 80084.4 | 0.404                        | 0.28   | 12      | 9.92                              | 0.16   | 28      | —                 | —      | —       |
| LNU869                                                                                    | 80085.2 | 0.414                        | 0.14   | 15      | —                                 | —      | —       | —                 | —      | —       |
| LNU869                                                                                    | 80085.3 | 0.477                        | L      | 33      | 13.9                              | 0.02   | 80      | 7.69              | L      | 25      |
| LNU840                                                                                    | 78676.4 | 0.456                        | L      | 27      | —                                 | —      | —       | 6.82              | 0.28   | 11      |
| LNU840                                                                                    | 78677.1 | 0.415                        | 0.08   | 15      | 8.73                              | 0.18   | 13      | —                 | —      | —       |
| LNU840                                                                                    | 78763.2 | —                            | —      | —       | 9.27                              | 0.09   | 20      | —                 | —      | —       |
| LNU840                                                                                    | 78763.6 | 0.432                        | 0.11   | 20      | —                                 | —      | —       | —                 | —      | —       |
| LNU837                                                                                    | 79574.5 | 0.433                        | 0.09   | 20      | 11.2                              | 0.17   | 44      | —                 | —      | —       |
| LNU837                                                                                    | 79574.7 | 0.434                        | 0.02   | 21      | 10.6                              | 0.03   | 38      | 7.16              | 0.02   | 16      |
| LNU837                                                                                    | 79575.2 | —                            | —      | —       | —                                 | —      | —       | 6.54              | 0.18   | 6       |
| LNU837                                                                                    | 79575.4 | 0.437                        | 0.19   | 21      | —                                 | —      | —       | —                 | —      | —       |
| LNU771                                                                                    | 80077.2 | 0.490                        | L      | 36      | 12.9                              | L      | 67      | 7.53              | L      | 22      |
| LNU771                                                                                    | 80078.5 | 0.398                        | 0.22   | 11      | 8.87                              | 0.18   | 15      | 6.58              | 0.23   | 7       |
| LNU771                                                                                    | 80079.3 | 0.495                        | L      | 37      | —                                 | —      | —       | 7.16              | 0.22   | 16      |
| LNU771                                                                                    | 80079.4 | 0.459                        | L      | 28      | 10.0                              | 0.19   | 30      | 6.89              | 0.03   | 12      |
| CONT.                                                                                     | —       | 0.360                        | —      | —       | 7.72                              | —      | —       | 6.17              | —      | —       |
| LNU964                                                                                    | 80552.4 | 0.460                        | 0.05   | 8       | 12.5                              | L      | 39      | 7.62              | 0.11   | 11      |
| LNU964                                                                                    | 80552.6 | 0.514                        | 0.10   | 21      | 12.2                              | 0.11   | 35      | 8.16              | L      | 19      |
| LNU957                                                                                    | 80437.1 | 0.478                        | 0.16   | 13      | 11.8                              | L      | 30      | 7.34              | 0.19   | 7       |
| LNU957                                                                                    | 80437.6 | —                            | —      | —       | —                                 | —      | —       | 7.61              | 0.05   | 11      |
| LNU953                                                                                    | 80428.1 | 0.467                        | 0.26   | 10      | 10.9                              | 0.02   | 20      | 7.32              | 0.15   | 7       |
| LNU920                                                                                    | 78509.5 | —                            | —      | —       | 10.8                              | 0.05   | 19      | 7.70              | 0.04   | 12      |
| LNU920                                                                                    | 78510.1 | —                            | —      | —       | 10.7                              | 0.17   | 18      | 7.66              | 0.02   | 12      |
| LNU911                                                                                    | 80420.5 | —                            | —      | —       | 10.8                              | 0.26   | 19      | 7.50              | 0.09   | 9       |
| LNU911                                                                                    | 80424.2 | 0.493                        | 0.03   | 16      | 11.8                              | 0.19   | 31      | 7.51              | 0.04   | 10      |
| LNU910                                                                                    | 80350.1 | —                            | —      | —       | —                                 | —      | —       | 7.20              | 0.20   | 5       |
| LNU903                                                                                    | 80417.6 | —                            | —      | —       | 10.7                              | 0.11   | 18      | 7.36              | 0.10   | 7       |

TABLE 102-continued

| Genes showing improved plant performance at nitrogen deficient conditions (T2 generation) |         |                              |        |         |                                   |        |         |                   |        |         |  |
|-------------------------------------------------------------------------------------------|---------|------------------------------|--------|---------|-----------------------------------|--------|---------|-------------------|--------|---------|--|
| Gene Name                                                                                 | Event # | Leaf Area [cm <sup>2</sup> ] |        |         | Roots Coverage [cm <sup>2</sup> ] |        |         | Roots Length [cm] |        |         |  |
|                                                                                           |         | Ave.                         | P-Val. | % Incr. | Ave.                              | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |  |
| LNU901                                                                                    | 80474.3 | —                            | —      | —       | 10.6                              | 0.17   | 17      | —                 | —      | —       |  |
| LNU901                                                                                    | 80476.4 | 0.450                        | 0.29   | 6       | 10.9                              | 0.27   | 20      | 7.38              | 0.07   | 8       |  |
| LNU897                                                                                    | 80448.3 | —                            | —      | —       | 11.1                              | 0.22   | 23      | —                 | —      | —       |  |
| LNU897                                                                                    | 80449.1 | —                            | —      | —       | 10.8                              | 0.14   | 20      | 7.50              | 0.05   | 9       |  |
| LNU892                                                                                    | 80412.1 | —                            | —      | —       | 12.5                              | 0.07   | 39      | 7.57              | 0.04   | 10      |  |
| LNU884                                                                                    | 80407.1 | 0.481                        | 0.07   | 13      | 15.0                              | 0.05   | 66      | 7.46              | 0.07   | 9       |  |
| LNU872                                                                                    | 77724.7 | —                            | —      | —       | —                                 | —      | —       | 7.52              | 0.08   | 10      |  |
| LNU872                                                                                    | 77725.6 | —                            | —      | —       | —                                 | —      | —       | 7.24              | 0.20   | 6       |  |
| LNU869                                                                                    | 80084.4 | 0.481                        | 0.27   | 13      | 15.0                              | L      | 66      | 8.19              | L      | 19      |  |
| LNU866                                                                                    | 80443.5 | 0.464                        | 0.07   | 9       | —                                 | —      | —       | —                 | —      | —       |  |
| LNU844                                                                                    | 80341.2 | —                            | —      | —       | —                                 | —      | —       | 7.31              | 0.22   | 7       |  |
| LNU844                                                                                    | 80342.1 | 0.457                        | 0.23   | 8       | 11.6                              | 0.06   | 29      | 7.54              | 0.13   | 10      |  |
| LNU844                                                                                    | 80342.4 | —                            | —      | —       | 10.1                              | 0.19   | 11      | 7.21              | 0.20   | 5       |  |
| LNU844                                                                                    | 80344.2 | —                            | —      | —       | 11.3                              | 0.06   | 25      | 7.64              | 0.08   | 12      |  |
| LNU834_H1                                                                                 | 80402.7 | 0.499                        | L      | 18      | 12.9                              | 0.09   | 43      | 7.77              | 0.01   | 13      |  |
| LNU805                                                                                    | 80784.1 | —                            | —      | —       | —                                 | —      | —       | 7.37              | 0.18   | 8       |  |
| LNU773                                                                                    | 80398.1 | —                            | —      | —       | 10.7                              | 0.13   | 19      | —                 | —      | —       |  |
| LNU749                                                                                    | 80793.5 | —                            | —      | —       | 11.9                              | 0.09   | 32      | 7.82              | 0.02   | 14      |  |
| CONT.                                                                                     | —       | 0.424                        | —      | —       | 9.05                              | —      | —       | 6.85              | —      | —       |  |
| LNU956                                                                                    | 80856.3 | 0.372                        | 0.21   | 12      | 8.68                              | 0.23   | 20      | 7.25              | 0.29   | 7       |  |
| LNU818                                                                                    | 80919.1 | —                            | —      | —       | —                                 | —      | —       | 7.21              | 0.09   | 6       |  |
| CONT.                                                                                     | —       | 0.334                        | —      | —       | 7.23                              | —      | —       | 6.79              | —      | —       |  |
| LNU975                                                                                    | 80622.1 | 0.400                        | 0.16   | 15      | —                                 | —      | —       | —                 | —      | —       |  |
| LNU975                                                                                    | 80624.3 | 0.375                        | 0.17   | 7       | 7.86                              | L      | 18      | 7.03              | L      | 14      |  |
| LNU832_H2                                                                                 | 80605.6 | 0.407                        | 0.02   | 17      | 8.29                              | 0.12   | 25      | 6.82              | L      | 11      |  |
| LNU819                                                                                    | 78133.3 | 0.405                        | 0.07   | 16      | 9.58                              | 0.01   | 44      | 6.60              | L      | 7       |  |
| LNU817                                                                                    | 80596.2 | —                            | —      | —       | 7.47                              | 0.19   | 12      | —                 | —      | —       |  |
| LNU801                                                                                    | 78584.7 | —                            | —      | —       | 7.34                              | 0.04   | 11      | —                 | —      | —       |  |
| LNU801                                                                                    | 78585.5 | —                            | —      | —       | 7.32                              | 0.09   | 10      | —                 | —      | —       |  |
| LNU801                                                                                    | 78585.7 | 0.427                        | 0.09   | 22      | 8.56                              | 0.07   | 29      | 6.47              | 0.26   | 5       |  |
| LNU800                                                                                    | 77896.2 | 0.433                        | L      | 24      | 10.00                             | 0.02   | 51      | —                 | —      | —       |  |
| LNU799                                                                                    | 78672.5 | —                            | —      | —       | 7.39                              | 0.24   | 11      | —                 | —      | —       |  |
| LNU794                                                                                    | 78522.1 | —                            | —      | —       | 8.83                              | 0.21   | 33      | 6.69              | 0.08   | 9       |  |
| LNU760_H1                                                                                 | 80127.4 | 0.378                        | 0.17   | 8       | 9.25                              | 0.06   | 39      | 6.45              | 0.30   | 5       |  |
| LNU760_H1                                                                                 | 80130.1 | —                            | —      | —       | 7.87                              | 0.09   | 19      | —                 | —      | —       |  |
| LNU760_H1                                                                                 | 80130.4 | —                            | —      | —       | 8.15                              | 0.01   | 23      | 6.38              | 0.16   | 4       |  |
| CONT.                                                                                     | —       | 0.350                        | —      | —       | 6.64                              | —      | —       | 6.14              | —      | —       |  |
| LNU971                                                                                    | 78393.3 | —                            | —      | —       | —                                 | —      | —       | 7.22              | 0.14   | 7       |  |
| LNU971                                                                                    | 78395.2 | —                            | —      | —       | —                                 | —      | —       | 7.06              | 0.21   | 5       |  |
| LNU971                                                                                    | 78395.5 | 0.486                        | 0.05   | 19      | —                                 | —      | —       | 7.11              | 0.19   | 5       |  |
| LNU931                                                                                    | 79774.1 | —                            | —      | —       | —                                 | —      | —       | 7.25              | 0.07   | 7       |  |
| LNU930                                                                                    | 79770.5 | —                            | —      | —       | 10.3                              | 0.30   | 10      | 7.15              | 0.16   | 6       |  |
| LNU930                                                                                    | 79772.5 | —                            | —      | —       | 11.8                              | 0.02   | 26      | 7.10              | 0.24   | 5       |  |
| LNU928                                                                                    | 78211.4 | 0.442                        | 0.15   | 8       | 11.0                              | 0.18   | 17      | 7.40              | 0.01   | 10      |  |
| LNU917                                                                                    | 77500.1 | 0.497                        | L      | 22      | 12.7                              | 0.01   | 36      | 7.47              | 0.01   | 11      |  |
| LNU904                                                                                    | 78987.1 | 0.471                        | 0.11   | 15      | —                                 | —      | —       | 7.38              | 0.17   | 9       |  |
| LNU904                                                                                    | 78987.2 | —                            | —      | —       | 10.7                              | 0.26   | 14      | —                 | —      | —       |  |
| LNU904                                                                                    | 78989.1 | —                            | —      | —       | —                                 | —      | —       | 7.04              | 0.16   | 4       |  |
| LNU899                                                                                    | 79765.4 | —                            | —      | —       | 10.4                              | 0.21   | 11      | 7.57              | L      | 12      |  |
| LNU899                                                                                    | 79765.5 | —                            | —      | —       | —                                 | —      | —       | 7.26              | 0.03   | 8       |  |
| LNU874                                                                                    | 78369.1 | 0.460                        | 0.08   | 13      | —                                 | —      | —       | 7.15              | 0.16   | 6       |  |
| LNU870                                                                                    | 78501.1 | 0.441                        | 0.16   | 8       | 12.1                              | 0.14   | 29      | 7.23              | 0.12   | 7       |  |
| LNU870                                                                                    | 78505.7 | 0.474                        | 0.09   | 16      | —                                 | —      | —       | —                 | —      | —       |  |
| LNU867                                                                                    | 79589.3 | —                            | —      | —       | 14.0                              | 0.05   | 49      | 7.27              | 0.27   | 8       |  |
| LNU867                                                                                    | 79590.5 | —                            | —      | —       | —                                 | —      | —       | 7.08              | 0.24   | 5       |  |
| LNU862                                                                                    | 79755.9 | —                            | —      | —       | 12.7                              | 0.09   | 36      | 7.39              | 0.02   | 10      |  |
| LNU862                                                                                    | 79757.1 | 0.447                        | 0.18   | 9       | 12.5                              | 0.04   | 33      | 7.29              | 0.04   | 8       |  |
| LNU856                                                                                    | 79753.3 | 0.481                        | 0.13   | 18      | 12.3                              | 0.02   | 31      | 7.93              | L      | 18      |  |
| LNU829                                                                                    | 77912.3 | —                            | —      | —       | —                                 | —      | —       | 7.16              | 0.27   | 6       |  |
| LNU829                                                                                    | 77912.5 | 0.455                        | 0.24   | 11      | 10.1                              | 0.28   | 8       | 7.44              | L      | 10      |  |
| LNU829                                                                                    | 77914.1 | —                            | —      | —       | —                                 | —      | —       | 7.18              | 0.07   | 6       |  |
| LNU829                                                                                    | 77914.2 | —                            | —      | —       | —                                 | —      | —       | 7.51              | L      | 11      |  |
| LNU796                                                                                    | 78234.5 | —                            | —      | —       | —                                 | —      | —       | 7.31              | 0.04   | 8       |  |
| LNU796                                                                                    | 78235.7 | —                            | —      | —       | —                                 | —      | —       | 7.44              | 0.10   | 10      |  |
| LNU792                                                                                    | 79161.2 | 0.499                        | 0.03   | 22      | 11.3                              | 0.08   | 21      | 7.29              | 0.03   | 8       |  |
| LNU792                                                                                    | 79215.3 | 0.469                        | 0.21   | 15      | —                                 | —      | —       | 7.16              | 0.08   | 6       |  |
| LNU763                                                                                    | 77588.1 | —                            | —      | —       | 10.5                              | 0.28   | 11      | —                 | —      | —       |  |
| LNU763                                                                                    | 77588.6 | 0.459                        | 0.14   | 12      | —                                 | —      | —       | —                 | —      | —       |  |
| LNU753                                                                                    | 77143.3 | —                            | —      | —       | —                                 | —      | —       | 7.38              | 0.02   | 9       |  |
| CONT.                                                                                     | —       | 0.409                        | —      | —       | 9.38                              | —      | —       | 6.75              | —      | —       |  |
| LNU955                                                                                    | 80432.7 | —                            | —      | —       | —                                 | —      | —       | 6.81              | 0.27   | 17      |  |

TABLE 102-continued

| Genes showing improved plant performance at nitrogen deficient conditions (T2 generation) |         |                              |        |         |                                   |        |         |                   |        |         |  |
|-------------------------------------------------------------------------------------------|---------|------------------------------|--------|---------|-----------------------------------|--------|---------|-------------------|--------|---------|--|
| Gene Name                                                                                 | Event # | Leaf Area [cm <sup>2</sup> ] |        |         | Roots Coverage [cm <sup>2</sup> ] |        |         | Roots Length [cm] |        |         |  |
|                                                                                           |         | Ave.                         | P-Val. | % Incr. | Ave.                              | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |  |
| LNU953                                                                                    | 80428.1 | 0.458                        | 0.06   | 11      | 9.88                              | 0.04   | 32      | 6.52              | 0.07   | 12      |  |
| LNU949                                                                                    | 80557.1 | —                            | —      | —       | 9.85                              | 0.05   | 32      | 6.31              | 0.15   | 9       |  |
| LNU949                                                                                    | 80557.2 | 0.468                        | 0.10   | 13      | 8.31                              | 0.29   | 11      | —                 | —      | —       |  |
| LNU949                                                                                    | 80557.4 | —                            | —      | —       | 9.07                              | 0.10   | 21      | —                 | —      | —       |  |
| LNU901                                                                                    | 80474.2 | 0.525                        | 0.10   | 27      | 10.4                              | 0.09   | 39      | 7.03              | 0.02   | 21      |  |
| LNU901                                                                                    | 80476.4 | 0.454                        | 0.25   | 9       | 10.5                              | 0.10   | 40      | 6.40              | 0.15   | 10      |  |
| LNU892                                                                                    | 80410.1 | —                            | —      | —       | 9.13                              | 0.03   | 22      | 6.37              | 0.09   | 10      |  |
| LNU892                                                                                    | 80414.7 | —                            | —      | —       | 9.87                              | 0.11   | 32      | —                 | —      | —       |  |
| LNU873                                                                                    | 80473.6 | —                            | —      | —       | 12.1                              | 0.17   | 61      | 6.45              | 0.26   | 11      |  |
| LNU866                                                                                    | 80444.6 | 0.467                        | 0.05   | 13      | 9.26                              | 0.18   | 24      | 6.23              | 0.29   | 7       |  |
| LNU834_H1                                                                                 | 80402.1 | —                            | —      | —       | 9.04                              | 0.21   | 21      | —                 | —      | —       |  |
| LNU834_H1                                                                                 | 80402.3 | —                            | —      | —       | 8.88                              | 0.21   | 19      | —                 | —      | —       |  |
| LNU834_H1                                                                                 | 80402.7 | —                            | —      | —       | —                                 | —      | —       | 6.38              | 0.16   | 10      |  |
| LNU834_H1                                                                                 | 80404.5 | 0.466                        | 0.17   | 12      | 11.5                              | 0.30   | 54      | —                 | —      | —       |  |
| LNU798                                                                                    | 79671.4 | 0.465                        | 0.09   | 12      | 9.92                              | 0.07   | 32      | 6.56              | 0.04   | 13      |  |
| LNU798                                                                                    | 79673.2 | —                            | —      | —       | —                                 | —      | —       | 6.61              | 0.04   | 14      |  |
| LNU787                                                                                    | 80546.5 | —                            | —      | —       | 8.44                              | 0.19   | 13      | —                 | —      | —       |  |
| LNU787                                                                                    | 80547.4 | —                            | —      | —       | 8.78                              | 0.12   | 17      | 6.83              | 0.01   | 18      |  |
| LNU787                                                                                    | 80547.5 | 0.484                        | L      | 17      | 11.8                              | L      | 58      | 7.34              | L      | 27      |  |
| LNU766                                                                                    | 78932.1 | 0.509                        | 0.02   | 23      | 10.3                              | 0.14   | 37      | 7.05              | L      | 22      |  |
| CONT.                                                                                     | —       | 0.415                        | —      | —       | 7.49                              | —      | —       | 5.79              | —      | —       |  |
| LNU884                                                                                    | 80407.5 | 0.490                        | 0.23   | 11      | 11.9                              | 0.27   | 17      | 6.99              | 0.23   | 7       |  |
| LNU844                                                                                    | 80341.2 | —                            | —      | —       | 12.4                              | 0.26   | 23      | 6.90              | 0.25   | 6       |  |
| LNU791                                                                                    | 77895.4 | —                            | —      | —       | 11.8                              | 0.14   | 17      | 7.07              | 0.05   | 8       |  |
| CONT.                                                                                     | —       | 0.440                        | —      | —       | 10.1                              | —      | —       | 6.53              | —      | —       |  |

Table 102:

“CONT.”—Control;

“Ave.”—Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

TABLE 103

| Genes showing improved plant performance at nitrogen deficient conditions (T1 generation) |                 |        |         |                   |        |         |
|-------------------------------------------------------------------------------------------|-----------------|--------|---------|-------------------|--------|---------|
| Gene Name                                                                                 | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         |
|                                                                                           | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |
| LNU859                                                                                    | 5.75            | 0.30   | 19      | —                 | —      | —       |
| CONT.                                                                                     | 4.84            | —      | —       | —                 | —      | —       |
| LNU919                                                                                    | 5.47            | 0.11   | 21      | —                 | —      | —       |
| LNU886                                                                                    | —               | —      | —       | 113.1             | 0.13   | 29      |
| LNU859                                                                                    | 5.65            | 0.07   | 26      | —                 | —      | —       |
| LNU821                                                                                    | —               | —      | —       | 100.6             | 0.23   | 14      |
| CONT.                                                                                     | 4.50            | —      | —       | 88.0              | —      | —       |
| LNU936                                                                                    | 5.53            | 0.22   | 20      | —                 | —      | —       |
| LNU786                                                                                    | 5.87            | 0.02   | 27      | —                 | —      | —       |
| CONT.                                                                                     | 4.62            | —      | —       | —                 | —      | —       |

Table 103:

“CONT.”—Control;

“Ave.”—Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

TABLE 104

| Genes showing improved plant performance at nitrogen deficient conditions (T1 generation) |                                   |        |         |                   |        |         |
|-------------------------------------------------------------------------------------------|-----------------------------------|--------|---------|-------------------|--------|---------|
| Gene Name                                                                                 | Roots Coverage [cm <sup>2</sup> ] |        |         | Roots Length [cm] |        |         |
|                                                                                           | Ave.                              | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |
| LNU818                                                                                    | —                                 | —      | —       | 6.65              | 0.28   | 11      |
| CONT.                                                                                     | —                                 | —      | —       | 6.00              | —      | —       |
| LNU956                                                                                    | 17.2                              | 0.17   | 20      | —                 | —      | —       |
| CONT.                                                                                     | 14.3                              | —      | —       | —                 | —      | —       |
| LNU946                                                                                    | 12.3                              | 0.25   | 22      | —                 | —      | —       |
| LNU887                                                                                    | 12.6                              | 0.22   | 25      | 7.14              | 0.16   | 13      |
| LNU786                                                                                    | 13.5                              | 0.03   | 34      | 7.03              | 0.19   | 11      |
| CONT.                                                                                     | 10.1                              | —      | —       | 6.34              | —      | —       |

Table 104:

“CONT.”—Control;

“Ave.”—Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

The genes listed in Tables 105-106 have improved plant relative growth rate (relative growth rate of the leaf area, root coverage and root length) when grown under limiting nitrogen growth conditions compared to control plants (T2 and T1 generations) that were grown under identical growth conditions. Plants showing fast growth rate show a better plant establishment in soil under nitrogen deficient conditions. Faster growth was observed when growth rate of leaf area, root length and root coverage was measured.

TABLE 105

| Genes showing improved plant growth rate<br>at nitrogen deficient conditions (T2 generation) |         |                  |            |            |                          |            |            |                       |            |            |
|----------------------------------------------------------------------------------------------|---------|------------------|------------|------------|--------------------------|------------|------------|-----------------------|------------|------------|
| Gene Name                                                                                    | Event # | RGR Of Leaf Area |            |            | RGR Of Roots<br>Coverage |            |            | RGR Of Root<br>Length |            |            |
|                                                                                              |         | Ave.             | P-<br>Val. | %<br>Incr. | Ave.                     | P-<br>Val. | %<br>Incr. | Ave.                  | P-<br>Val. | %<br>Incr. |
| LNU954                                                                                       | 80358.5 | 0.0422           | 0.08       | 22         | 1.29                     | 0.01       | 42         | 0.649                 | 0.03       | 22         |
| LNU938                                                                                       | 80352.1 | —                | —          | —          | 1.48                     | L          | 63         | 0.640                 | 0.03       | 21         |
| LNU938                                                                                       | 80352.2 | —                | —          | —          | —                        | —          | —          | 0.613                 | 0.08       | 16         |
| LNU938                                                                                       | 80353.1 | 0.0418           | 0.09       | 20         | 1.21                     | 0.01       | 33         | 0.666                 | L          | 26         |
| LNU938                                                                                       | 80354.1 | —                | —          | —          | —                        | —          | —          | 0.588                 | 0.28       | 11         |
| LNU938                                                                                       | 80355.5 | —                | —          | —          | 1.55                     | 0.01       | 70         | 0.673                 | 0.02       | 27         |
| LNU910                                                                                       | 80346.1 | —                | —          | —          | —                        | —          | —          | 0.631                 | 0.14       | 19         |
| LNU910                                                                                       | 80348.1 | —                | —          | —          | —                        | —          | —          | 0.615                 | 0.09       | 16         |
| LNU910                                                                                       | 80350.1 | 0.0445           | 0.04       | 28         | 1.33                     | 0.01       | 47         | 0.646                 | 0.03       | 22         |
| LNU869                                                                                       | 80083.3 | —                | —          | —          | 1.56                     | L          | 72         | 0.680                 | 0.03       | 28         |
| LNU869                                                                                       | 80084.3 | 0.0410           | 0.15       | 18         | 1.23                     | L          | 35         | 0.614                 | 0.11       | 16         |
| LNU869                                                                                       | 80084.4 | —                | —          | —          | 1.15                     | 0.11       | 27         | —                     | —          | —          |
| LNU869                                                                                       | 80085.2 | —                | —          | —          | 1.12                     | 0.21       | 23         | —                     | —          | —          |
| LNU869                                                                                       | 80085.3 | 0.0444           | 0.08       | 28         | 1.66                     | L          | 82         | 0.673                 | 0.05       | 27         |
| LNU840                                                                                       | 78676.4 | 0.0428           | 0.15       | 23         | —                        | —          | —          | —                     | —          | —          |
| LNU840                                                                                       | 78677.1 | —                | —          | —          | 1.04                     | 0.24       | 15         | 0.606                 | 0.15       | 14         |
| LNU840                                                                                       | 78763.2 | —                | —          | —          | 1.12                     | 0.13       | 24         | 0.605                 | 0.24       | 14         |
| LNU840                                                                                       | 78763.6 | 0.0405           | 0.23       | 17         | —                        | —          | —          | 0.598                 | 0.26       | 13         |
| LNU837                                                                                       | 79574.5 | —                | —          | —          | 1.35                     | 0.02       | 49         | 0.622                 | 0.13       | 17         |
| LNU837                                                                                       | 79574.7 | 0.0416           | 0.11       | 20         | 1.27                     | L          | 40         | 0.664                 | 0.01       | 25         |
| LNU837                                                                                       | 79575.2 | —                | —          | —          | —                        | —          | —          | 0.589                 | 0.23       | 11         |
| LNU837                                                                                       | 79575.4 | 0.0420           | 0.22       | 21         | 1.13                     | 0.19       | 24         | —                     | —          | —          |
| LNU771                                                                                       | 80077.2 | 0.0454           | 0.02       | 31         | 1.52                     | L          | 68         | 0.689                 | L          | 30         |
| LNU771                                                                                       | 80077.4 | —                | —          | —          | —                        | —          | —          | 0.594                 | 0.22       | 12         |
| LNU771                                                                                       | 80078.5 | —                | —          | —          | 1.06                     | 0.21       | 17         | 0.605                 | 0.15       | 14         |
| LNU771                                                                                       | 80079.3 | 0.0451           | 0.07       | 30         | 1.25                     | 0.06       | 38         | 0.656                 | 0.08       | 24         |
| LNU771                                                                                       | 80079.4 | 0.0454           | 0.02       | 31         | 1.18                     | 0.08       | 30         | 0.613                 | 0.12       | 16         |
| CONT.                                                                                        | —       | 0.0347           | —          | —          | 0.908                    | —          | —          | 0.530                 | —          | —          |
| LNU964                                                                                       | 80548.3 | —                | —          | —          | —                        | —          | —          | 0.685                 | 0.26       | 12         |
| LNU964                                                                                       | 80552.4 | 0.0460           | 0.23       | 13         | 1.49                     | 0.01       | 40         | 0.727                 | 0.07       | 19         |
| LNU964                                                                                       | 80552.6 | 0.0475           | 0.17       | 17         | 1.45                     | 0.04       | 37         | 0.734                 | 0.04       | 20         |
| LNU957                                                                                       | 80437.1 | —                | —          | —          | 1.38                     | 0.06       | 30         | —                     | —          | —          |
| LNU953                                                                                       | 80428.1 | —                | —          | —          | 1.27                     | 0.18       | 20         | —                     | —          | —          |
| LNU920                                                                                       | 78509.5 | —                | —          | —          | 1.27                     | 0.19       | 19         | 0.703                 | 0.14       | 15         |
| LNU920                                                                                       | 78510.1 | —                | —          | —          | 1.26                     | 0.22       | 18         | —                     | —          | —          |
| LNU911                                                                                       | 80424.2 | 0.0463           | 0.23       | 14         | 1.35                     | 0.13       | 27         | —                     | —          | —          |
| LNU903                                                                                       | 80417.6 | —                | —          | —          | 1.29                     | 0.18       | 21         | 0.693                 | 0.18       | 14         |
| LNU901                                                                                       | 80474.3 | —                | —          | —          | 1.27                     | 0.22       | 19         | 0.709                 | 0.15       | 16         |
| LNU901                                                                                       | 80476.4 | —                | —          | —          | 1.27                     | 0.25       | 19         | —                     | —          | —          |
| LNU897                                                                                       | 80448.3 | —                | —          | —          | 1.31                     | 0.17       | 23         | —                     | —          | —          |
| LNU897                                                                                       | 80449.1 | —                | —          | —          | 1.30                     | 0.17       | 22         | 0.696                 | 0.17       | 14         |
| LNU892                                                                                       | 80412.1 | —                | —          | —          | 1.51                     | 0.02       | 42         | 0.701                 | 0.15       | 15         |
| LNU884                                                                                       | 80407.1 | —                | —          | —          | 1.81                     | L          | 70         | —                     | —          | —          |
| LNU872                                                                                       | 77724.7 | —                | —          | —          | —                        | —          | —          | 0.691                 | 0.19       | 13         |
| LNU872                                                                                       | 77725.6 | —                | —          | —          | —                        | —          | —          | 0.704                 | 0.13       | 15         |
| LNU869                                                                                       | 80084.3 | —                | —          | —          | 1.26                     | 0.28       | 18         | —                     | —          | —          |
| LNU869                                                                                       | 80084.4 | 0.0473           | 0.20       | 16         | 1.80                     | L          | 69         | 0.760                 | 0.02       | 25         |
| LNU844                                                                                       | 80341.2 | —                | —          | —          | —                        | —          | —          | 0.701                 | 0.16       | 15         |
| LNU844                                                                                       | 80342.1 | —                | —          | —          | 1.38                     | 0.06       | 29         | —                     | —          | —          |
| LNU844                                                                                       | 80344.2 | —                | —          | —          | 1.35                     | 0.09       | 27         | 0.698                 | 0.18       | 14         |
| LNU834_H1                                                                                    | 80402.7 | —                | —          | —          | 1.55                     | 0.01       | 46         | 0.765                 | 0.02       | 25         |
| LNU773                                                                                       | 80398.1 | —                | —          | —          | 1.30                     | 0.18       | 22         | —                     | —          | —          |
| LNU749                                                                                       | 80793.5 | —                | —          | —          | 1.42                     | 0.05       | 33         | 0.722                 | 0.08       | 18         |
| CONT.                                                                                        | —       | 0.0407           | —          | —          | 1.06                     | —          | —          | 0.610                 | —          | —          |
| LNU956                                                                                       | 80854.3 | —                | —          | —          | 1.06                     | 0.29       | 21         | —                     | —          | —          |
| LNU956                                                                                       | 80856.3 | 0.0385           | 0.26       | 12         | 1.06                     | 0.19       | 22         | 0.711                 | 0.26       | 8          |
| CONT.                                                                                        | —       | 0.0344           | —          | —          | 0.873                    | —          | —          | 0.661                 | —          | —          |
| LNU975                                                                                       | 80624.3 | —                | —          | —          | 0.904                    | 0.17       | 16         | —                     | —          | —          |
| LNU832_H2                                                                                    | 80605.6 | 0.0371           | 0.14       | 17         | 0.951                    | 0.11       | 22         | 0.610                 | 0.02       | 11         |
| LNU819                                                                                       | 78133.3 | 0.0361           | 0.26       | 14         | 1.12                     | L          | 44         | —                     | —          | —          |
| LNU801                                                                                       | 78585.7 | 0.0370           | 0.21       | 17         | 0.994                    | 0.05       | 27         | —                     | —          | —          |
| LNU800                                                                                       | 77896.2 | 0.0377           | 0.09       | 19         | 1.18                     | L          | 51         | —                     | —          | —          |
| LNU794                                                                                       | 78522.1 | —                | —          | —          | 1.03                     | 0.06       | 31         | —                     | —          | —          |
| LNU760_H1                                                                                    | 80127.2 | —                | —          | —          | 0.896                    | 0.27       | 15         | —                     | —          | —          |
| LNU760_H1                                                                                    | 80127.4 | —                | —          | —          | 1.08                     | L          | 37         | —                     | —          | —          |
| LNU760_H1                                                                                    | 80130.1 | —                | —          | —          | 0.909                    | 0.20       | 16         | —                     | —          | —          |
| LNU760_H1                                                                                    | 80130.4 | —                | —          | —          | 0.964                    | 0.05       | 23         | 0.600                 | 0.05       | 10         |
| CONT.                                                                                        | —       | 0.0317           | —          | —          | 0.782                    | —          | —          | 0.548                 | —          | —          |
| LNU971                                                                                       | 78395.2 | —                | —          | —          | —                        | —          | —          | 0.658                 | 0.21       | 10         |
| LNU971                                                                                       | 78395.5 | 0.0486           | 0.09       | 21         | —                        | —          | —          | —                     | —          | —          |
| LNU930                                                                                       | 79772.5 | —                | —          | —          | 1.39                     | 0.04       | 26         | —                     | —          | —          |

TABLE 105-continued

| Genes showing improved plant growth rate<br>at nitrogen deficient conditions (T2 generation) |         |                  |            |            |                          |            |            |                       |            |            |
|----------------------------------------------------------------------------------------------|---------|------------------|------------|------------|--------------------------|------------|------------|-----------------------|------------|------------|
| Gene Name                                                                                    | Event # | RGR Of Leaf Area |            |            | RGR Of Roots<br>Coverage |            |            | RGR Of Root<br>Length |            |            |
|                                                                                              |         | Ave.             | P-<br>Val. | %<br>Incr. | Ave.                     | P-<br>Val. | %<br>Incr. | Ave.                  | P-<br>Val. | %<br>Incr. |
| LNU928                                                                                       | 78211.4 | 0.0470           | 0.14       | 17         | 1.30                     | 0.19       | 18         | 0.672                 | 0.13       | 12         |
| LNU917                                                                                       | 77500.1 | 0.0487           | 0.08       | 21         | 1.49                     | 0.01       | 36         | —                     | —          | —          |
| LNU904                                                                                       | 78987.1 | 0.0469           | 0.19       | 17         | —                        | —          | —          | —                     | —          | —          |
| LNU904                                                                                       | 78987.2 | 0.0455           | 0.26       | 13         | 1.26                     | 0.27       | 15         | —                     | —          | —          |
| LNU874                                                                                       | 78369.1 | 0.0481           | 0.09       | 20         | —                        | —          | —          | —                     | —          | —          |
| LNU870                                                                                       | 78501.1 | —                | —          | —          | 1.45                     | 0.04       | 32         | 0.659                 | 0.25       | 10         |
| LNU870                                                                                       | 78505.7 | 0.0478           | 0.13       | 19         | 1.28                     | 0.26       | 16         | —                     | —          | —          |
| LNU867                                                                                       | 79589.3 | —                | —          | —          | 1.68                     | L          | 52         | 0.684                 | 0.12       | 14         |
| LNU862                                                                                       | 79755.9 | —                | —          | —          | 1.52                     | 0.01       | 38         | 0.702                 | 0.03       | 17         |
| LNU862                                                                                       | 79757.1 | 0.0463           | 0.20       | 15         | 1.51                     | 0.01       | 37         | 0.696                 | 0.06       | 16         |
| LNU856                                                                                       | 79753.3 | 0.0495           | 0.08       | 23         | 1.47                     | 0.01       | 33         | 0.693                 | 0.07       | 16         |
| LNU856                                                                                       | 79753.5 | 0.0453           | 0.29       | 13         | 1.31                     | 0.21       | 19         | —                     | —          | —          |
| LNU852                                                                                       | 79580.2 | —                | —          | —          | —                        | —          | —          | 0.654                 | 0.24       | 9          |
| LNU829                                                                                       | 77912.3 | —                | —          | —          | —                        | —          | —          | 0.658                 | 0.25       | 10         |
| LNU796                                                                                       | 78234.5 | 0.0455           | 0.23       | 13         | —                        | —          | —          | —                     | —          | —          |
| LNU796                                                                                       | 78235.7 | —                | —          | —          | 1.45                     | 0.08       | 32         | 0.668                 | 0.20       | 11         |
| LNU792                                                                                       | 79161.2 | 0.0485           | 0.09       | 21         | 1.37                     | 0.06       | 24         | 0.680                 | 0.10       | 14         |
| LNU792                                                                                       | 79215.1 | —                | —          | —          | —                        | —          | —          | 0.665                 | 0.17       | 11         |
| LNU792                                                                                       | 79215.3 | —                | —          | —          | 1.38                     | 0.12       | 26         | —                     | —          | —          |
| LNU763                                                                                       | 77588.1 | —                | —          | —          | 1.26                     | 0.26       | 15         | —                     | —          | —          |
| LNU763                                                                                       | 77588.8 | —                | —          | —          | —                        | —          | —          | 0.706                 | 0.04       | 18         |
| LNU753                                                                                       | 77141.2 | —                | —          | —          | 1.46                     | 0.07       | 32         | 0.666                 | 0.21       | 11         |
| CONT.                                                                                        | —       | 0.0402           | —          | —          | 1.10                     | —          | —          | 0.599                 | —          | —          |
| LNU955                                                                                       | 80432.7 | —                | —          | —          | 1.61                     | 0.01       | 78         | 0.669                 | 0.22       | 19         |
| LNU953                                                                                       | 80428.1 | —                | —          | —          | 1.19                     | 0.04       | 31         | —                     | —          | —          |
| LNU949                                                                                       | 80557.1 | —                | —          | —          | 1.18                     | 0.05       | 30         | —                     | —          | —          |
| LNU949                                                                                       | 80557.2 | 0.0476           | 0.13       | 18         | —                        | —          | —          | —                     | —          | —          |
| LNU949                                                                                       | 80557.4 | —                | —          | —          | 1.11                     | 0.16       | 22         | —                     | —          | —          |
| LNU914                                                                                       | 80514.5 | —                | —          | —          | 1.09                     | 0.25       | 20         | —                     | —          | —          |
| LNU901                                                                                       | 80474.2 | 0.0513           | 0.06       | 27         | 1.24                     | 0.03       | 37         | —                     | —          | —          |
| LNU901                                                                                       | 80474.3 | —                | —          | —          | 1.10                     | 0.23       | 21         | —                     | —          | —          |
| LNU901                                                                                       | 80476.4 | —                | —          | —          | 1.27                     | 0.03       | 39         | 0.632                 | 0.30       | 12         |
| LNU892                                                                                       | 80410.1 | —                | —          | —          | 1.11                     | 0.09       | 23         | 0.649                 | 0.14       | 15         |
| LNU892                                                                                       | 80414.7 | —                | —          | —          | 1.21                     | 0.05       | 34         | —                     | —          | —          |
| LNU873                                                                                       | 80473.6 | —                | —          | —          | 1.44                     | L          | 59         | —                     | —          | —          |
| LNU866                                                                                       | 80444.6 | —                | —          | —          | 1.12                     | 0.16       | 24         | 0.643                 | 0.25       | 14         |
| LNU834_H1                                                                                    | 80402.1 | —                | —          | —          | 1.11                     | 0.16       | 22         | —                     | —          | —          |
| LNU834_H1                                                                                    | 80402.3 | —                | —          | —          | 1.08                     | 0.20       | 19         | —                     | —          | —          |
| LNU834_H1                                                                                    | 80404.5 | —                | —          | —          | 1.40                     | 0.04       | 55         | 0.656                 | 0.22       | 16         |
| LNU798                                                                                       | 79671.4 | —                | —          | —          | 1.18                     | 0.06       | 30         | —                     | —          | —          |
| LNU798                                                                                       | 79673.2 | —                | —          | —          | 1.08                     | 0.26       | 19         | —                     | —          | —          |
| LNU787                                                                                       | 80546.5 | —                | —          | —          | —                        | —          | —          | 0.648                 | 0.20       | 15         |
| LNU787                                                                                       | 80547.4 | —                | —          | —          | 1.06                     | 0.21       | 16         | —                     | —          | —          |
| LNU787                                                                                       | 80547.5 | 0.0478           | 0.11       | 18         | 1.41                     | L          | 56         | 0.686                 | 0.08       | 22         |
| LNU766                                                                                       | 78932.1 | 0.0482           | 0.11       | 19         | 1.23                     | 0.04       | 36         | 0.653                 | 0.19       | 16         |
| CONT.                                                                                        | —       | 0.0404           | —          | —          | 0.907                    | —          | —          | 0.565                 | —          | —          |
| LNU884                                                                                       | 80407.5 | —                | —          | —          | 1.42                     | 0.22       | 21         | 0.633                 | 0.04       | 17         |
| LNU872                                                                                       | 77725.4 | —                | —          | —          | —                        | —          | —          | 0.584                 | 0.22       | 8          |
| LNU844                                                                                       | 80341.2 | —                | —          | —          | 1.47                     | 0.17       | 24         | 0.591                 | 0.25       | 9          |
| LNU791                                                                                       | 77895.4 | —                | —          | —          | 1.37                     | 0.26       | 16         | 0.584                 | 0.22       | 8          |
| CONT.                                                                                        | —       | —                | —          | —          | 1.18                     | —          | —          | 0.541                 | —          | —          |

Table 105:

"CONT."—Control;

"Ave." —Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

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TABLE 106

| Genes showing improved plant growth rate<br>at nitrogen deficient conditions (T1 generation) |                       |        |         |                    |        |         |
|----------------------------------------------------------------------------------------------|-----------------------|--------|---------|--------------------|--------|---------|
| Gene Name                                                                                    | RGR Of Roots Coverage |        |         | RGR Of Root Length |        |         |
|                                                                                              | Ave.                  | P-Val. | % Incr. | Ave.               | P-Val. | % Incr. |
| LNU818                                                                                       | —                     | —      | —       | 0.691              | 0.11   | 14      |
| CONT.                                                                                        | —                     | —      | —       | 0.606              | —      | —       |
| LNU956                                                                                       | 2.09                  | 0.13   | 20      | —                  | —      | —       |
| CONT.                                                                                        | 1.74                  | —      | —       | —                  | —      | —       |
| LNU946                                                                                       | 1.51                  | 0.20   | 23      | —                  | —      | —       |
| LNU932                                                                                       | —                     | —      | —       | 0.739              | 0.23   | 17      |
| LNU887                                                                                       | 1.53                  | 0.17   | 25      | 0.722              | 0.18   | 14      |
| LNU786                                                                                       | 1.65                  | 0.04   | 35      | 0.741              | 0.15   | 17      |
| CONT.                                                                                        | 1.22                  | —      | —       | 0.635              | —      | —       |

Table 106:

“CONT.”—Control;

“Ave.” —Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

The genes listed in Tables 107-110 improved plant NUE when grown at standard nitrogen concentration levels. These genes produced larger plant biomass (plant fresh and dry weight; leaf area, root coverage and roots length) when grown under standard nitrogen growth conditions compared to control plants that were grown under identical growth conditions in T2 (Tables 107-108) and T1 (Tables 109-110) generations. Larger plant biomass under these growth conditions indicates the high ability of the plant to better metabolize the nitrogen present in the medium. Plants producing larger root biomass have better possibilities to absorb larger amount of nitrogen from soil.

TABLE 107

| Genes showing improved plant performance at<br>standard nitrogen growth conditions (T2 generation) |         |                 |        |            |                   |        |            |
|----------------------------------------------------------------------------------------------------|---------|-----------------|--------|------------|-------------------|--------|------------|
|                                                                                                    |         | Dry Weight [mg] |        |            | Fresh Weight [mg] |        |            |
| Gene Name                                                                                          | Event # | Ave.            | P-Val. | %<br>Incr. | Ave.              | P-Val. | %<br>Incr. |
| LNU938                                                                                             | 80355.5 | 6.80            | 0.27   | 16         | 140.0             | 0.21   | 43         |
| LNU910                                                                                             | 80348.5 | —               | —      | —          | 129.1             | 0.21   | 32         |
| LNU910                                                                                             | 80350.1 | 7.17            | 0.12   | 23         | 118.7             | 0.18   | 21         |
| LNU869                                                                                             | 80083.3 | 7.10            | 0.09   | 21         | 142.9             | 0.12   | 46         |
| LNU869                                                                                             | 80084.4 | 10.3            | 0.10   | 77         | 184.2             | L      | 88         |
| LNU869                                                                                             | 80085.3 | 8.25            | 0.01   | 41         | 158.8             | 0.02   | 63         |
| LNU771                                                                                             | 80077.2 | —               | —      | —          | 170.8             | L      | 75         |
| LNU771                                                                                             | 80079.3 | —               | —      | —          | 123.8             | 0.26   | 27         |

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TABLE 107-continued

| Genes showing improved plant performance at<br>standard nitrogen growth conditions (T2 generation) |           |          |                 |        |                   |       |        |         |
|----------------------------------------------------------------------------------------------------|-----------|----------|-----------------|--------|-------------------|-------|--------|---------|
| 5                                                                                                  | Gene Name | Event #  | Dry Weight [mg] |        | Fresh Weight [mg] |       |        |         |
|                                                                                                    |           |          | Ave.            | P-Val. | % Incr.           | Ave.  | P-Val. | % Incr. |
| 10                                                                                                 | CONT.     | —        | 5.85            | —      | —                 | 97.7  | —      | —       |
|                                                                                                    | LNU964    | 80548.3  | 5.30            | 0.25   | 25                | 112.8 | 0.03   | 40      |
|                                                                                                    | LNU964    | 80552.4  | 7.85            | 0.04   | 86                | 162.1 | 0.06   | 101     |
|                                                                                                    | LNU964    | 80552.6  | 5.70            | 0.01   | 35                | 103.6 | 0.07   | 28      |
|                                                                                                    | LNU955    | 80432.7  | 6.63            | 0.03   | 57                | 120.4 | 0.03   | 49      |
| 15                                                                                                 | LNU953    | 80428.1  | 5.40            | 0.15   | 28                | —     | —      | —       |
|                                                                                                    | LNU953    | 80429.2  | 6.83            | 0.16   | 62                | 143.8 | 0.24   | 78      |
|                                                                                                    | LNU949    | 80557.4  | 5.85            | L      | 38                | 112.4 | L      | 39      |
|                                                                                                    | LNU914    | 80514.5  | 5.70            | 0.16   | 35                | 115.7 | 0.18   | 43      |
|                                                                                                    | LNU901    | 80474.2  | 6.75            | 0.03   | 60                | 128.8 | L      | 60      |
| 20                                                                                                 | LNU901    | 80474.3  | 7.58            | 0.02   | 79                | 130.8 | 0.06   | 62      |
|                                                                                                    | LNU901    | 80476.4  | —               | —      | —                 | 116.2 | 0.17   | 44      |
|                                                                                                    | LNU892    | 80410.1  | 6.50            | L      | 54                | 137.1 | 0.03   | 70      |
|                                                                                                    | LNU892    | 80412.1  | 5.70            | 0.21   | 35                | —     | —      | —       |
|                                                                                                    | LNU892    | 80414.7  | 6.03            | 0.13   | 43                | 125.5 | 0.19   | 55      |
| 25                                                                                                 | LNU873    | 80469.3  | 6.42            | 0.10   | 52                | 119.8 | 0.18   | 49      |
|                                                                                                    | LNU873    | 80473.6  | 4.80            | 0.20   | 14                | 96.2  | 0.24   | 19      |
|                                                                                                    | LNU866    | 80444.6  | 7.20            | 0.03   | 70                | 150.2 | 0.15   | 86      |
|                                                                                                    | LNU843    | 78963.5  | 4.60            | 0.23   | 9                 | 93.2  | 0.21   | 16      |
|                                                                                                    | LNU834_   | 80402.1  | 6.35            | 0.14   | 50                | 116.8 | 0.08   | 45      |
| 30                                                                                                 | H1        | —        | —               | —      | —                 | —     | —      | —       |
|                                                                                                    | LNU834_   | 80402.3  | 5.88            | 0.04   | 39                | 97.9  | 0.22   | 21      |
|                                                                                                    | H1        | —        | —               | —      | —                 | —     | —      | —       |
|                                                                                                    | LNU834_   | 80404.5  | 6.05            | 0.05   | 43                | 113.1 | 0.03   | 40      |
|                                                                                                    | H1        | —        | —               | —      | —                 | —     | —      | —       |
| 35                                                                                                 | LNU798    | 79669.1  | 5.67            | 0.12   | 34                | 102.2 | 0.04   | 27      |
|                                                                                                    | LNU798    | 79671.4  | —               | —      | —                 | 132.5 | L      | 64      |
|                                                                                                    | LNU798    | 79673.2  | 5.62            | 0.13   | 33                | 106.7 | 0.14   | 32      |
|                                                                                                    | LNU787    | 80546.5  | 6.68            | 0.04   | 58                | 126.0 | 0.01   | 56      |
|                                                                                                    | LNU787    | 80547.5  | 6.70            | 0.07   | 59                | 139.7 | 0.01   | 73      |
| 40                                                                                                 | LNU766    | 78931.1  | 6.05            | L      | 43                | 117.1 | L      | 45      |
|                                                                                                    | LNU766    | 78931.10 | 7.52            | L      | 78                | 129.5 | 0.02   | 60      |
|                                                                                                    | LNU766    | 78932.1  | 5.47            | 0.20   | 30                | 102.8 | 0.03   | 27      |
|                                                                                                    | CONT.     | —        | 4.22            | —      | —                 | 80.7  | —      | —       |
|                                                                                                    | LNU952    | 78218.3  | 6.10            | 0.25   | 34                | —     | —      | —       |
|                                                                                                    | LNU952    | 78218.6  | 6.17            | 0.26   | 35                | 133.8 | 0.14   | 28      |
|                                                                                                    | LNU905    | 79674.4  | 7.12            | 0.15   | 56                | 138.1 | 0.20   | 32      |
|                                                                                                    | LNU897    | 80449.1  | 6.10            | 0.16   | 34                | —     | —      | —       |
|                                                                                                    | LNU884    | 80407.5  | 8.55            | 0.05   | 87                | 172.8 | 0.16   | 66      |
|                                                                                                    | LNU872    | 77723.2  | —               | —      | —                 | 138.9 | 0.15   | 33      |
|                                                                                                    | LNU872    | 77724.7  | 8.20            | 0.02   | 80                | 154.9 | 0.07   | 48      |
|                                                                                                    | CONT.     | —        | 4.57            | —      | —                 | 104.4 | —      | —       |

Table 107:

“CONT.”—Control;

“Ave.” —Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

TABLE 108

| Genes showing improved plant performance at<br>standard nitrogen growth conditions (T2 generation) |         |                                 |        |         |                                      |        |         |                      |        |         |
|----------------------------------------------------------------------------------------------------|---------|---------------------------------|--------|---------|--------------------------------------|--------|---------|----------------------|--------|---------|
| Gene Name                                                                                          | Event # | Leaf Area<br>[cm <sup>2</sup> ] |        |         | Roots Coverage<br>[cm <sup>2</sup> ] |        |         | Roots Length<br>[cm] |        |         |
|                                                                                                    |         | Ave.                            | P-Val. | % Incr. | Ave.                                 | P-Val. | % Incr. | Ave.                 | P-Val. | % Incr. |
| LNU954                                                                                             | 80360.1 | 0.510                           | 0.16   | 9       | —                                    | —      | —       | —                    | —      | —       |
| LNU938                                                                                             | 80355.5 | 0.554                           | 0.05   | 19      | —                                    | —      | —       | —                    | —      | —       |
| LNU910                                                                                             | 80348.1 | 0.560                           | 0.27   | 20      | —                                    | —      | —       | —                    | —      | —       |
| LNU910                                                                                             | 80348.5 | 0.586                           | L      | 26      | —                                    | —      | —       | 6.83                 | 0.26   | 9       |
| LNU910                                                                                             | 80350.1 | 0.620                           | 0.02   | 33      | 7.98                                 | 0.11   | 22      | 6.97                 | L      | 11      |
| LNU869                                                                                             | 80083.3 | 0.603                           | 0.06   | 29      | —                                    | —      | —       | —                    | —      | —       |
| LNU869                                                                                             | 80084.3 | 0.564                           | 0.07   | 21      | —                                    | —      | —       | —                    | —      | —       |
| LNU869                                                                                             | 80084.4 | 0.767                           | L      | 65      | —                                    | —      | —       | —                    | —      | —       |

TABLE 108-continued

| Genes showing improved plant performance at<br>standard nitrogen growth conditions (T2 generation) |          |                                 |            |            |                                      |            |            |                      |            |            |
|----------------------------------------------------------------------------------------------------|----------|---------------------------------|------------|------------|--------------------------------------|------------|------------|----------------------|------------|------------|
| Gene Name                                                                                          | Event #  | Leaf Area<br>[cm <sup>2</sup> ] |            |            | Roots Coverage<br>[cm <sup>2</sup> ] |            |            | Roots Length<br>[cm] |            |            |
|                                                                                                    |          | Ave.                            | P-<br>Val. | %<br>Incr. | Ave.                                 | P-<br>Val. | %<br>Incr. | Ave.                 | P-<br>Val. | %<br>Incr. |
| LNU869                                                                                             | 80085.3  | 0.656                           | L          | 41         | 8.85                                 | L          | 36         | 7.14                 | L          | 14         |
| LNU840                                                                                             | 78676.4  | 0.527                           | 0.18       | 13         | —                                    | —          | —          | 6.55                 | 0.19       | 5          |
| LNU840                                                                                             | 78677.1  | 0.533                           | 0.24       | 14         | —                                    | —          | —          | —                    | —          | —          |
| LNU840                                                                                             | 78763.2  | 0.540                           | 0.16       | 16         | —                                    | —          | —          | —                    | —          | —          |
| LNU771                                                                                             | 80077.2  | 0.646                           | 0.19       | 38         | 9.56                                 | L          | 47         | 7.19                 | L          | 15         |
| LNU771                                                                                             | 80079.3  | 0.572                           | 0.19       | 23         | —                                    | —          | —          | —                    | —          | —          |
| LNU771                                                                                             | 80079.4  | 0.538                           | 0.07       | 15         | —                                    | —          | —          | —                    | —          | —          |
| CONT.                                                                                              | —        | 0.466                           | —          | —          | 6.52                                 | —          | —          | 6.26                 | —          | —          |
| LNU964                                                                                             | 80548.1  | 0.557                           | L          | 23         | 6.39                                 | 0.20       | 15         | 6.21                 | 0.06       | 8          |
| LNU964                                                                                             | 80548.3  | 0.514                           | 0.02       | 14         | —                                    | —          | —          | —                    | —          | —          |
| LNU964                                                                                             | 80552.4  | 0.699                           | 0.01       | 54         | 7.77                                 | 0.13       | 40         | 6.15                 | 0.26       | 7          |
| LNU964                                                                                             | 80552.6  | 0.500                           | 0.10       | 10         | —                                    | —          | —          | 6.06                 | 0.28       | 6          |
| LNU955                                                                                             | 80432.7  | 0.597                           | 0.03       | 32         | 9.08                                 | 0.09       | 64         | —                    | —          | —          |
| LNU953                                                                                             | 80428.1  | 0.554                           | 0.03       | 22         | 7.46                                 | 0.07       | 35         | 6.21                 | 0.01       | 8          |
| LNU953                                                                                             | 80429.2  | 0.640                           | 0.12       | 41         | —                                    | —          | —          | —                    | —          | —          |
| LNU949                                                                                             | 80557.4  | 0.612                           | L          | 35         | 8.01                                 | 0.02       | 45         | 6.43                 | L          | 12         |
| LNU914                                                                                             | 80514.5  | 0.598                           | L          | 32         | —                                    | —          | —          | —                    | —          | —          |
| LNU914                                                                                             | 80515.6  | 0.543                           | 0.09       | 20         | —                                    | —          | —          | —                    | —          | —          |
| LNU901                                                                                             | 80474.2  | 0.598                           | 0.02       | 32         | 8.49                                 | 0.02       | 53         | 6.53                 | 0.07       | 14         |
| LNU901                                                                                             | 80474.3  | 0.605                           | L          | 34         | 6.52                                 | 0.10       | 18         | —                    | —          | —          |
| LNU901                                                                                             | 80476.4  | 0.513                           | 0.05       | 13         | —                                    | —          | —          | 6.25                 | 0.20       | 9          |
| LNU892                                                                                             | 80410.1  | 0.582                           | 0.07       | 29         | 7.37                                 | 0.01       | 33         | 6.24                 | 0.04       | 9          |
| LNU892                                                                                             | 80414.7  | 0.552                           | 0.12       | 22         | —                                    | —          | —          | —                    | —          | —          |
| LNU873                                                                                             | 80469.3  | 0.540                           | L          | 19         | 6.46                                 | 0.21       | 17         | —                    | —          | —          |
| LNU873                                                                                             | 80473.6  | 0.502                           | 0.16       | 11         | 6.19                                 | 0.25       | 12         | —                    | —          | —          |
| LNU866                                                                                             | 80444.6  | 0.678                           | 0.13       | 50         | —                                    | —          | —          | —                    | —          | —          |
| LNU834_H1                                                                                          | 80402.1  | 0.597                           | 0.03       | 32         | 8.21                                 | 0.09       | 48         | 6.67                 | L          | 16         |
| LNU834_H1                                                                                          | 80402.3  | 0.519                           | 0.03       | 15         | 6.42                                 | 0.10       | 16         | —                    | —          | —          |
| LNU834_H1                                                                                          | 80404.5  | 0.588                           | L          | 30         | 7.17                                 | L          | 30         | 6.30                 | 0.21       | 10         |
| LNU798                                                                                             | 79669.1  | 0.517                           | 0.02       | 14         | —                                    | —          | —          | —                    | —          | —          |
| LNU798                                                                                             | 79671.4  | 0.681                           | L          | 51         | 9.55                                 | 0.29       | 73         | 6.63                 | 0.26       | 16         |
| LNU798                                                                                             | 79673.2  | 0.573                           | 0.13       | 27         | 7.55                                 | 0.29       | 36         | 6.66                 | 0.14       | 16         |
| LNU787                                                                                             | 80546.5  | 0.568                           | 0.01       | 26         | 7.62                                 | 0.19       | 38         | 6.31                 | 0.24       | 10         |
| LNU787                                                                                             | 80547.4  | —                               | —          | —          | 6.11                                 | 0.29       | 10         | 6.47                 | 0.02       | 13         |
| LNU787                                                                                             | 80547.5  | 0.607                           | 0.06       | 34         | 8.87                                 | 0.03       | 60         | 6.53                 | 0.02       | 14         |
| LNU766                                                                                             | 78931.1  | 0.535                           | 0.12       | 18         | 7.02                                 | 0.09       | 27         | —                    | —          | —          |
| LNU766                                                                                             | 78931.10 | 0.648                           | 0.03       | 43         | 8.84                                 | 0.01       | 60         | 6.78                 | 0.03       | 18         |
| LNU766                                                                                             | 78932.1  | 0.589                           | 0.05       | 30         | 7.38                                 | 0.17       | 33         | 6.79                 | 0.04       | 19         |
| CONT.                                                                                              | —        | 0.453                           | —          | —          | 5.53                                 | —          | —          | 5.73                 | —          | —          |
| LNU952                                                                                             | 78218.6  | 0.695                           | 0.04       | 34         | 7.32                                 | 0.16       | 26         | —                    | —          | —          |
| LNU920                                                                                             | 78507.1  | —                               | —          | —          | 7.69                                 | 0.24       | 33         | —                    | —          | —          |
| LNU920                                                                                             | 78510.1  | —                               | —          | —          | —                                    | —          | —          | 6.53                 | 0.29       | 10         |
| LNU905                                                                                             | 79674.4  | 0.663                           | 0.16       | 28         | 8.22                                 | 0.07       | 42         | —                    | —          | —          |
| LNU905                                                                                             | 79676.1  | 0.614                           | 0.20       | 19         | 7.19                                 | 0.28       | 24         | —                    | —          | —          |
| LNU897                                                                                             | 80449.1  | 0.620                           | 0.17       | 20         | —                                    | —          | —          | —                    | —          | —          |
| LNU884                                                                                             | 80407.5  | 0.791                           | 0.03       | 53         | 9.14                                 | 0.04       | 57         | 6.76                 | 0.19       | 14         |
| LNU872                                                                                             | 77723.2  | 0.689                           | 0.15       | 33         | —                                    | —          | —          | —                    | —          | —          |
| LNU872                                                                                             | 77724.7  | 0.650                           | 0.10       | 26         | 9.50                                 | 0.05       | 64         | 6.90                 | 0.13       | 17         |
| LNU791                                                                                             | 77895.4  | —                               | —          | —          | —                                    | —          | —          | 6.62                 | 0.24       | 12         |
| CONT.                                                                                              | —        | 0.517                           | —          | —          | 5.81                                 | —          | —          | 5.91                 | —          | —          |

Table 108:

“CONT.”—Control;

“Ave.” —Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

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TABLE 109

| Genes showing improved plant performance<br>at standard nitrogen growth conditions (T1 generation) |                 |        |         |                   |        |         |
|----------------------------------------------------------------------------------------------------|-----------------|--------|---------|-------------------|--------|---------|
| Gene Name                                                                                          | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         |
|                                                                                                    | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |
| LNU919                                                                                             | —               | —      | —       | 139.8             | 0.19   | 15      |
| CONT.                                                                                              | —               | —      | —       | 121.4             | —      | —       |
| LNU956                                                                                             | 9.90            | 0.18   | 24      | —                 | —      | —       |

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TABLE 109-continued

| Genes showing improved plant performance<br>at standard nitrogen growth conditions (T1 generation) |                 |        |         |                   |        |         |
|----------------------------------------------------------------------------------------------------|-----------------|--------|---------|-------------------|--------|---------|
| Gene Name                                                                                          | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         |
|                                                                                                    | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. |
| LNU749                                                                                             | 10.0            | 0.20   | 26      | —                 | —      | —       |
| CONT.                                                                                              | 7.97            | —      | —       | —                 | —      | —       |

Table 109:  
 “CONT.”—Control;  
 “Ave.” —Average;  
 “% Incr.” = % increment;  
 “p-val.”—p-value;  
 L means that p-value is less than 0.01, p < 0.1 was considered as significant.

TABLE 110

| Genes showing improved plant performance<br>at standard nitrogen growth conditions (T1 generation) |                              |        |         |                                   |        |         |                   |        |
|----------------------------------------------------------------------------------------------------|------------------------------|--------|---------|-----------------------------------|--------|---------|-------------------|--------|
| Gene Name                                                                                          | Leaf Area [cm <sup>2</sup> ] |        |         | Roots Coverage [cm <sup>2</sup> ] |        |         | Roots Length [cm] |        |
|                                                                                                    | Ave.                         | P-Val. | % Incr. | Ave.                              | P-Val. | % Incr. | Ave.              | P-Val. |
| LNU886                                                                                             | 0.752                        | 0.19   | 14      | —                                 | —      | —       | —                 | —      |
| LNU821                                                                                             | —                            | —      | —       | 6.89                              | 0.27   | 18      | 5.89              | 0.19   |
| CONT.                                                                                              | 0.660                        | —      | —       | 5.83                              | —      | —       | 5.50              | —      |

Table 110:  
 “CONT.”—Control;  
 “Ave.” —Average;  
 “% Incr.” = % increment;  
 “p-val.”—p-value;  
 L means that p-value is less than 0.01, p < 0.1 was considered as significant.

35 The genes listed in Tables 111-112 improved plant relative growth rate (RGR of leaf area, root length and root coverage) when grown at standard nitrogen concentration levels. These genes produced plants that grew faster than control plants when grown under standard nitrogen growth conditions. Faster growth was observed when growth rate of leaf area, root length and root coverage was measured.

TABLE 111

| Genes showing improved growth rate at standard<br>nitrogen growth conditions (T2 generation) |         |                  |        |         |                       |        |         |                    |        |         |
|----------------------------------------------------------------------------------------------|---------|------------------|--------|---------|-----------------------|--------|---------|--------------------|--------|---------|
| Gene Name                                                                                    | Event # | RGR Of Leaf Area |        |         | RGR Of Roots Coverage |        |         | RGR Of Root Length |        |         |
|                                                                                              |         | Ave.             | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. | Ave.               | P-Val. | % Incr. |
| LNU954                                                                                       | 80360.4 | —                | —      | —       | —                     | —      | —       | 0.583              | 0.23   | 10      |
| LNU938                                                                                       | 80354.1 | —                | —      | —       | —                     | —      | —       | 0.588              | 0.21   | 11      |
| LNU938                                                                                       | 80355.5 | 0.0549           | 0.14   | 18      | —                     | —      | —       | —                  | —      | —       |
| LNU910                                                                                       | 80348.1 | 0.0555           | 0.22   | 19      | —                     | —      | —       | —                  | —      | —       |
| LNU910                                                                                       | 80348.5 | 0.0588           | 0.11   | 26      | —                     | —      | —       | —                  | —      | —       |
| LNU910                                                                                       | 80350.1 | 0.0617           | 0.02   | 32      | 0.929                 | 0.07   | 23      | 0.611              | 0.06   | 16      |
| LNU869                                                                                       | 80083.3 | 0.0584           | 0.12   | 25      | —                     | —      | —       | —                  | —      | —       |
| LNU869                                                                                       | 80084.3 | 0.0549           | 0.16   | 18      | —                     | —      | —       | —                  | —      | —       |
| LNU869                                                                                       | 80084.4 | 0.0767           | L      | 64      | 0.911                 | 0.23   | 20      | —                  | —      | —       |
| LNU869                                                                                       | 80085.3 | 0.0652           | L      | 40      | 1.02                  | L      | 34      | 0.583              | 0.21   | 10      |
| LNU840                                                                                       | 78677.1 | 0.0537           | 0.25   | 15      | —                     | —      | —       | —                  | —      | —       |
| LNU840                                                                                       | 78763.2 | 0.0529           | 0.30   | 13      | —                     | —      | —       | —                  | —      | —       |
| LNU771                                                                                       | 80077.2 | 0.0630           | 0.05   | 35      | 1.11                  | L      | 46      | 0.627              | 0.09   | 19      |
| LNU771                                                                                       | 80079.3 | 0.0537           | 0.30   | 15      | 0.859                 | 0.29   | 13      | —                  | —      | —       |
| LNU771                                                                                       | 80079.4 | 0.0544           | 0.18   | 17      | —                     | —      | —       | 0.577              | 0.29   | 9       |
| CONT.                                                                                        | —       | 0.0466           | —      | —       | 0.758                 | —      | —       | 0.528              | —      | —       |
| LNU964                                                                                       | 80548.1 | 0.0572           | 0.03   | 23      | 0.773                 | 0.24   | 16      | 0.632              | 0.08   | 11      |
| LNU964                                                                                       | 80548.3 | 0.0522           | 0.26   | 12      | —                     | —      | —       | —                  | —      | —       |
| LNU964                                                                                       | 80552.4 | 0.0733           | L      | 58      | 0.917                 | 0.03   | 38      | —                  | —      | —       |

TABLE 111-continued

| Genes showing improved growth rate at standard<br>nitrogen growth conditions (T2 generation) |         |                  |            |            |                          |            |            |                       |            |            |  |
|----------------------------------------------------------------------------------------------|---------|------------------|------------|------------|--------------------------|------------|------------|-----------------------|------------|------------|--|
| Gene Name                                                                                    | Event # | RGR Of Leaf Area |            |            | RGR Of Roots<br>Coverage |            |            | RGR Of Root<br>Length |            |            |  |
|                                                                                              |         | Ave.             | P-<br>Val. | %<br>Incr. | Ave.                     | P-<br>Val. | %<br>Incr. | Ave.                  | P-<br>Val. | %<br>Incr. |  |
| LNU964                                                                                       | 80552.6 | 0.0543           | 0.12       | 17         | —                        | —          | —          | —                     | —          | —          |  |
| LNU955                                                                                       | 80432.7 | 0.0607           | 0.02       | 31         | 1.11                     | L          | 67         | —                     | —          | —          |  |
| LNU953                                                                                       | 80428.1 | 0.0561           | 0.04       | 21         | 0.879                    | 0.04       | 32         | —                     | —          | —          |  |
| LNU953                                                                                       | 80429.2 | 0.0662           | L          | 42         | 0.787                    | 0.27       | 18         | —                     | —          | —          |  |
| LNU949                                                                                       | 80557.4 | 0.0630           | L          | 36         | 0.971                    | L          | 46         | 0.627                 | 0.13       | 10         |  |
| LNU914                                                                                       | 80514.5 | 0.0596           | 0.03       | 28         | —                        | —          | —          | —                     | —          | —          |  |
| LNU914                                                                                       | 80515.6 | 0.0550           | 0.12       | 18         | —                        | —          | —          | —                     | —          | —          |  |
| LNU901                                                                                       | 80474.2 | 0.0592           | 0.01       | 27         | 1.01                     | L          | 52         | —                     | —          | —          |  |
| LNU901                                                                                       | 80474.3 | 0.0623           | L          | 34         | 0.792                    | 0.16       | 19         | —                     | —          | —          |  |
| LNU901                                                                                       | 80476.4 | 0.0534           | 0.15       | 15         | —                        | —          | —          | —                     | —          | —          |  |
| LNU892                                                                                       | 80410.1 | 0.0589           | 0.02       | 27         | 0.890                    | 0.02       | 34         | 0.615                 | 0.17       | 8          |  |
| LNU892                                                                                       | 80414.7 | 0.0551           | 0.12       | 19         | —                        | —          | —          | —                     | —          | —          |  |
| LNU873                                                                                       | 80469.3 | 0.0550           | 0.08       | 18         | 0.779                    | 0.26       | 17         | —                     | —          | —          |  |
| LNU873                                                                                       | 80473.6 | 0.0522           | 0.24       | 12         | —                        | —          | —          | —                     | —          | —          |  |
| LNU866                                                                                       | 80444.6 | 0.0664           | L          | 43         | 0.901                    | 0.08       | 35         | —                     | —          | —          |  |
| LNU834_H1                                                                                    | 80402.1 | 0.0614           | L          | 32         | 0.965                    | 0.01       | 45         | 0.614                 | 0.21       | 8          |  |
| LNU834_H1                                                                                    | 80402.3 | 0.0529           | 0.14       | 14         | 0.768                    | 0.25       | 15         | —                     | —          | —          |  |
| LNU834_H1                                                                                    | 80404.5 | 0.0588           | 0.01       | 27         | 0.859                    | 0.03       | 29         | —                     | —          | —          |  |
| LNU798                                                                                       | 79671.4 | 0.0701           | L          | 51         | 1.12                     | L          | 68         | —                     | —          | —          |  |
| LNU798                                                                                       | 79673.2 | 0.0585           | 0.05       | 26         | 0.903                    | 0.10       | 36         | 0.636                 | 0.17       | 12         |  |
| LNU787                                                                                       | 80546.5 | 0.0572           | 0.03       | 23         | 0.899                    | 0.06       | 35         | —                     | —          | —          |  |
| LNU787                                                                                       | 80547.4 | —                | —          | —          | —                        | —          | —          | 0.609                 | 0.25       | 7          |  |
| LNU787                                                                                       | 80547.5 | 0.0659           | L          | 42         | 1.06                     | L          | 59         | 0.634                 | 0.07       | 12         |  |
| LNU766                                                                                       | 78931.1 | 0.0539           | 0.15       | 16         | 0.830                    | 0.09       | 25         | —                     | —          | —          |  |
| LNU766                                                                                       | 78931.1 | 0.0668           | L          | 44         | 1.02                     | L          | 54         | 0.639                 | 0.10       | 13         |  |
| LNU766                                                                                       | 78932.1 | 0.0584           | 0.04       | 26         | 0.864                    | 0.08       | 30         | 0.612                 | 0.30       | 8          |  |
| CONT.                                                                                        | —       | 0.0464           | —          | —          | 0.665                    | —          | —          | 0.568                 | —          | —          |  |
| LNU952                                                                                       | 78218.6 | 0.0694           | 0.04       | 41         | 0.879                    | 0.15       | 31         | 0.589                 | 0.13       | 19         |  |
| LNU920                                                                                       | 78507.1 | —                | —          | —          | 0.907                    | 0.20       | 36         | —                     | —          | —          |  |
| LNU905                                                                                       | 79674.4 | 0.0658           | 0.16       | 33         | 0.960                    | 0.06       | 44         | —                     | —          | —          |  |
| LNU905                                                                                       | 79676.1 | 0.0620           | 0.15       | 26         | 0.848                    | 0.22       | 27         | 0.584                 | 0.12       | 18         |  |
| LNU897                                                                                       | 80449.1 | 0.0618           | 0.17       | 25         | —                        | —          | —          | —                     | —          | —          |  |
| LNU884                                                                                       | 80407.5 | 0.0776           | 0.01       | 57         | 1.06                     | 0.02       | 58         | 0.593                 | 0.21       | 19         |  |
| LNU872                                                                                       | 77723.2 | 0.0681           | 0.07       | 38         | 0.834                    | 0.26       | 25         | 0.582                 | 0.26       | 17         |  |
| LNU872                                                                                       | 77724.7 | 0.0670           | 0.03       | 36         | 1.08                     | 0.03       | 61         | —                     | —          | —          |  |
| LNU773                                                                                       | 80399.2 | —                | —          | —          | 0.895                    | 0.24       | 34         | 0.583                 | 0.28       | 17         |  |
| CONT.                                                                                        | —       | 0.0493           | —          | —          | 0.669                    | —          | —          | 0.497                 | —          | —          |  |

Table 111:

"CONT."—Control;

"Ave." —Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

TABLE 112

| Genes showing improved growth rate at standard<br>nitrogen growth conditions (T1 generation) |                  |            |            |                       |            |            |                    |            |            |
|----------------------------------------------------------------------------------------------|------------------|------------|------------|-----------------------|------------|------------|--------------------|------------|------------|
| Gene<br>Name                                                                                 | RGR Of Leaf Area |            |            | RGR Of Roots Coverage |            |            | RGR Of Root Length |            |            |
|                                                                                              | Ave.             | P-<br>Val. | %<br>Incr. | Ave.                  | P-<br>Val. | %<br>Incr. | Ave.               | P-<br>Val. | %<br>Incr. |
| LNU886                                                                                       | —                | —          | —          | 0.809                 | 0.25       | 19         | —                  | —          | —          |
| LNU821                                                                                       | —                | —          | —          | 0.815                 | 0.19       | 20         | 0.590              | 0.18       | 9          |
| CONT.                                                                                        | —                | —          | —          | 0.680                 | —          | —          | 0.540              | —          | —          |
| LNU956                                                                                       | 0.0900           | 0.29       | 21         | —                     | —          | —          | —                  | —          | —          |
| CONT.                                                                                        | 0.0741           | —          | —          | —                     | —          | —          | —                  | —          | —          |

Table 112:

"CONT."—Control;

"Ave." —Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

Evaluation of Transgenic *Arabidopsis* NUE, Yield  
and Plant Growth Rate Under Low or Normal  
Nitrogen Fertilization in Greenhouse Assay

Assay 1: Nitrogen Use Efficiency: Seed yield plant biomass and plant growth rate at limited and optimal nitrogen concentration under greenhouse conditions—This assay follows seed yield production, the biomass formation and the rosette area growth of plants grown in the greenhouse at limiting and non-limiting nitrogen growth conditions. Transgenic *Arabidopsis* seeds were sown in agar media supplemented with ½ MS medium and a selection agent (Kanamycin). The T<sub>2</sub> transgenic seedlings were then transplanted to 1.7 trays filled with peat and perlite in a 1:1 ratio. The trays were irrigated with a solution containing nitrogen limiting conditions, which were achieved by irrigating the plants with a solution containing 1.5 mM inorganic nitrogen in the form of KNO<sub>3</sub>, supplemented with 1 mM KH<sub>2</sub>PO<sub>4</sub>, 1 mM MgSO<sub>4</sub>, 3.6 mM KCl, 2 mM CaCl<sub>2</sub> and microelements, while normal nitrogen levels were achieved by applying a solution of 6 mM inorganic nitrogen also in the form of KNO<sub>3</sub> with 1 mM KH<sub>2</sub>PO<sub>4</sub>, 1 mM MgSO<sub>4</sub>, 2 mM CaCl<sub>2</sub> and microelements. All plants were grown in the greenhouse until mature seeds. Seeds were harvested, extracted and weight. The remaining plant biomass (the above ground tissue) was also harvested, and weighted immediately or following drying in oven at 50° C. for 24 hours.

Each construct was validated at its T<sub>2</sub> generation. Transgenic plants transformed with a construct conformed by an empty vector carrying the 35S promoter and the selectable marker was used as control.

The plants are analyzed for their overall size, growth rate, flowering, seed yield, 1,000-seed weight, dry matter and harvest index (HI=seed yield/dry matter). Transgenic plants performance was compared to control plants grown in parallel under the same conditions. Mock—transgenic plants expressing the uidA reporter gene (GUS-Intron) or with no gene at all, under the same promoter were used as control.

The experiment was planned in nested randomized plot distribution. For each gene of the invention three to five independent transformation events were analyzed from each construct.

Digital imaging—A laboratory image acquisition system, which consists of a digital reflex camera (Canon EOS 300D) attached with a 55 mm focal length lens (Canon EF-S series), mounted on a reproduction device (Kaiser RS), which includes 4 light units (4×150 Watts light bulb) was used for capturing images of plant samples.

The image capturing process was repeated every 2 days starting from day 1 after transplanting till day 15. Same camera, placed in a custom made iron mount, was used for capturing images of larger plants seen in white tubs in an environmental controlled greenhouse. The tubs were square shape include 1.7 liter trays. During the capture process, the tubs were placed beneath the iron mount, while avoiding direct sun light and casting of shadows.

An image analysis system was used, which consists of a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.39 [Java based image processing program which was developed at the U.S. National Institutes of Health and freely available on the internet at rsbweb (dot) nih (dot) gov/]. Images are captured in resolution of 10 Mega Pixels (3888×2592 pixels) and stored in a low compression JPEG (Joint Photographic Experts Group standard) format. Next, analyzed data was

saved to text files and processed using the JMP statistical analysis software (SAS institute).

Leaf analysis—Using the digital analysis leaves data was calculated, including leaf number, rosette area, rosette diameter, leaf blade area.

Vegetative growth rate: the relative growth rate (RGR) of leaf number [Formula VIII (described above)], rosette area (Formula IX, described above), plot coverage (Formula XI, described above) and harvest index (Formula XV) is calculated with the indicated formulas.

Seeds average weight—At the end of the experiment all seeds were collected.

The seeds were scattered on a glass tray and a picture is taken. Using the digital analysis, the number of seeds in each sample was calculated.

Dry weight and seed yield—On about day 80 from sowing, the plants were harvested and left to dry at 30° C. in a drying chamber. The biomass and seed weight of each plot were measured and divided by the number of plants in each plot. Dry weight=total weight of the vegetative portion above ground (excluding roots) after drying at 30° C. in a drying chamber; Seed yield per plant=total seed weight per plant (gr). 1000 seed weight (the weight of 1000 seeds) (gr.).

The harvest index (HI) is calculated using Formula XV as described above.

Oil percentage in seeds—At the end of the experiment all seeds from each plot were collected. Seeds from 3 plots were mixed grounded and then mounted onto the extraction chamber. 210 ml of n-Hexane (Cat No. 080951 Biolab Ltd.) were used as the solvent. The extraction was performed for 30 hours at medium heat 50° C. Once the extraction has ended the n-Hexane was evaporated using the evaporator at 35° C. and vacuum conditions. The process was repeated twice. The information gained from the Soxhlet extractor (Soxhlet, F. Die gewichtsanalytische Bestimmung des MilCHFettes, Polytechnisches J. (Dingier's) 1879, 232, 461) was used to create a calibration curve for the Low Resonance NMR. The content of oil of all seed samples is determined using the Low Resonance NMR (MARAN Ultra—Oxford Instrument) and its MultiQuant software package.

Silique length analysis—On day 50 from sowing, 30 siliques from different plants in each plot were sampled in block A. The chosen siliques were green-yellow in color and were collected from the bottom parts of a grown plant's stem. A digital photograph was taken to determine silique's length.

Statistical analyses—To identify genes conferring significantly improved tolerance to abiotic stresses, the results obtained from the transgenic plants were compared to those obtained from control plants. To identify outperforming genes and constructs, results from the independent transformation events tested were analyzed separately. Data was analyzed using Student's t-test and results were considered significant if the p value was less than 0.1. The JMP statistics software package was used (Version 5.2.1, SAS Institute Inc., Cary, N.C., USA).

Tables 113-122 summarize the observed phenotypes of transgenic plants exogenously expressing the gene constructs using the greenhouse seed maturation (GH-SM) assays under low nitrogen (Tables 113-117) or normal nitrogen (Tables 118-122) conditions. The evaluation of each gene was performed by testing the performance of different number of events. Event with p-value <0.1 was considered statistically significant.

TABLE 113

| Genes showing improved plant performance at low Nitrogen growth conditions under regulation of At6669 promoter |          |                 |        |         |           |        |         |                         |        |         |
|----------------------------------------------------------------------------------------------------------------|----------|-----------------|--------|---------|-----------|--------|---------|-------------------------|--------|---------|
| Gene Name                                                                                                      | Event #  | Dry Weight [mg] |        |         | Flowering |        |         | Inflorescence Emergence |        |         |
|                                                                                                                |          | Ave.            | P-Val. | % Incr. | Ave.      | P-Val. | % Incr. | Ave.                    | P-Val. | % Incr. |
| LNU947                                                                                                         | 77448.4  | 458.1           | 0.03   | 17      | —         | —      | —       | —                       | —      | —       |
| LNU895                                                                                                         | 77934.1  | 416.9           | 0.10   | 6       | —         | —      | —       | —                       | —      | —       |
| LNU895                                                                                                         | 77935.3  | 424.4           | 0.05   | 8       | —         | —      | —       | —                       | —      | —       |
| LNU878                                                                                                         | 77252.1  | 474.4           | 0.21   | 21      | —         | —      | —       | —                       | —      | —       |
| LNU878                                                                                                         | 77254.3  | 420.6           | 0.07   | 7       | —         | —      | —       | —                       | —      | —       |
| LNU820                                                                                                         | 77806.2  | 431.9           | 0.02   | 10      | —         | —      | —       | —                       | —      | —       |
| LNU820                                                                                                         | 77807.2  | 423.8           | 0.05   | 8       | —         | —      | —       | —                       | —      | —       |
| LNU820                                                                                                         | 77809.1  | 445.6           | 0.22   | 14      | —         | —      | —       | —                       | —      | —       |
| LNU815                                                                                                         | 77494.1  | 425.6           | 0.08   | 9       | —         | —      | —       | —                       | —      | —       |
| LNU808                                                                                                         | 77678.3  | 456.9           | 0.03   | 17      | —         | —      | —       | —                       | —      | —       |
| LNU803                                                                                                         | 77902.2  | 446.9           | L      | 14      | —         | —      | —       | —                       | —      | —       |
| LNU784                                                                                                         | 77612.3  | 480.0           | L      | 23      | —         | —      | —       | —                       | —      | —       |
| LNU784                                                                                                         | 77615.1  | 429.4           | 0.03   | 10      | —         | —      | —       | —                       | —      | —       |
| LNU779                                                                                                         | 77887.1  | 428.1           | 0.03   | 9       | —         | —      | —       | —                       | —      | —       |
| LNU774                                                                                                         | 77247.4  | 408.5           | 0.25   | 4       | —         | —      | —       | —                       | —      | —       |
| CONT.                                                                                                          | —        | 391.6           | —      | —       | —         | —      | —       | —                       | —      | —       |
| LNU895                                                                                                         | 77934.4  | 616.9           | 0.07   | 8       | 23.0      | 0.04   | -5      | 18.3                    | 0.21   | -4      |
| LNU895                                                                                                         | 77935.4  | —               | —      | —       | —         | —      | —       | 18.9                    | 0.30   | -1      |
| LNU890                                                                                                         | 78202.1  | 616.9           | 0.18   | 8       | —         | —      | —       | —                       | —      | —       |
| LNU878                                                                                                         | 77251.3  | 633.1           | 0.19   | 11      | 23.5      | 0.02   | -3      | 18.0                    | L      | -6      |
| LNU878                                                                                                         | 77254.2  | 606.9           | 0.12   | 6       | —         | —      | —       | —                       | —      | —       |
| LNU838                                                                                                         | 77616.2  | —               | —      | —       | 23.5      | 0.02   | -3      | —                       | —      | —       |
| LNU838                                                                                                         | 77616.3  | 593.8           | 0.30   | 4       | 23.6      | 0.04   | -2      | —                       | —      | —       |
| LNU838                                                                                                         | 77617.2  | —               | —      | —       | —         | —      | —       | 18.5                    | 0.02   | -3      |
| LNU838                                                                                                         | 77617.5  | —               | —      | —       | 23.7      | 0.19   | -2      | —                       | —      | —       |
| LNU811                                                                                                         | 78179.1  | —               | —      | —       | 23.2      | 0.26   | -4      | 18.4                    | 0.01   | -4      |
| LNU808                                                                                                         | 77677.2  | —               | —      | —       | —         | —      | —       | 18.8                    | 0.27   | -1      |
| LNU808                                                                                                         | 77678.3  | 633.8           | 0.12   | 11      | 22.7      | 0.19   | -6      | 17.4                    | 0.21   | -9      |
| LNU808                                                                                                         | 77679.3  | —               | —      | —       | 23.2      | 0.09   | -4      | 17.4                    | L      | -9      |
| LNU803                                                                                                         | 77901.2  | —               | —      | —       | 23.7      | 0.06   | -2      | —                       | —      | —       |
| LNU803                                                                                                         | 77902.2  | 676.2           | L      | 18      | —         | —      | —       | —                       | —      | —       |
| LNU793                                                                                                         | 78169.2  | —               | —      | —       | 22.9      | L      | -5      | —                       | —      | —       |
| LNU784                                                                                                         | 77615.1  | —               | —      | —       | 23.2      | 0.09   | -4      | —                       | —      | —       |
| LNU784                                                                                                         | 77615.12 | —               | —      | —       | 23.1      | 0.15   | -4      | 17.5                    | L      | -8      |
| LNU775                                                                                                         | 77592.3  | 819.8           | 0.06   | 43      | 23.1      | 0.01   | -5      | 16.6                    | L      | -13     |
| LNU774                                                                                                         | 77246.3  | 678.1           | 0.23   | 18      | 21.4      | L      | -12     | 16.6                    | L      | -13     |
| LNU774                                                                                                         | 77247.4  | 587.5           | 0.25   | 3       | 23.1      | 0.17   | -5      | 18.6                    | 0.06   | -2      |
| LNU754                                                                                                         | 77801.2  | —               | —      | —       | 23.1      | 0.15   | -4      | 18.2                    | 0.05   | -5      |
| CONT.                                                                                                          | —        | 572.3           | —      | —       | 24.2      | —      | —       | 19.1                    | —      | —       |

Table 113:

“CONT.”—Control;

“Ave.” —Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01,  $p < 0.1$  was considered as significant. transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880). It should be noted that a negative increment (in percentages) when found in flowering or inflorescence emergence indicates drought avoidance of the plant.

TABLE 114

| Genes showing improved plant performance at low Nitrogen growth conditions under regulation of At6669 promoter |         |                                    |        |         |             |        |         |                                  |        |         |
|----------------------------------------------------------------------------------------------------------------|---------|------------------------------------|--------|---------|-------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                                      | Event # | Leaf Blade Area [cm <sup>2</sup> ] |        |         | Leaf Number |        |         | Plot Coverage [cm <sup>2</sup> ] |        |         |
|                                                                                                                |         | Ave.                               | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU895                                                                                                         | 77933.2 | —                                  | —      | —       | 11.8        | 0.15   | 3       | —                                | —      | —       |
| LNU878                                                                                                         | 77251.3 | —                                  | —      | —       | —           | —      | —       | 107.1                            | 0.24   | 19      |
| LNU878                                                                                                         | 77252.1 | 2.10                               | 0.15   | 40      | —           | —      | —       | 125.2                            | 0.21   | 39      |
| LNU878                                                                                                         | 77254.3 | 1.58                               | 0.04   | 5       | —           | —      | —       | 94.6                             | 0.02   | 5       |
| LNU815                                                                                                         | 77492.6 | —                                  | —      | —       | 11.8        | 0.15   | 3       | 104.9                            | 0.24   | 17      |
| LNU815                                                                                                         | 77495.1 | 1.62                               | 0.19   | 8       | —           | —      | —       | 99.5                             | 0.28   | 11      |
| LNU808                                                                                                         | 77678.3 | 1.62                               | 0.26   | 8       | —           | —      | —       | 95.9                             | 0.04   | 7       |
| LNU803                                                                                                         | 77902.2 | —                                  | —      | —       | 12.2        | L      | 8       | —                                | —      | —       |

TABLE 114-continued

| Genes showing improved plant performance at low Nitrogen growth conditions under regulation of At6669 promoter |         |                                    |        |         |             |        |         |                                  |        |         |
|----------------------------------------------------------------------------------------------------------------|---------|------------------------------------|--------|---------|-------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                                      | Event # | Leaf Blade Area [cm <sup>2</sup> ] |        |         | Leaf Number |        |         | Plot Coverage [cm <sup>2</sup> ] |        |         |
|                                                                                                                |         | Ave.                               | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU803                                                                                                         | 77904.4 | 1.78                               | 0.15   | 19      | —           | —      | —       | 105.6                            | L      | 18      |
| LNU784                                                                                                         | 77615.7 | —                                  | —      | —       | —           | —      | —       | 101.6                            | 0.18   | 13      |
| LNU784                                                                                                         | 77615.9 | 1.76                               | 0.11   | 17      | —           | —      | —       | 101.2                            | 0.04   | 13      |
| LNU779                                                                                                         | 77887.1 | —                                  | —      | —       | —           | —      | —       | 93.5                             | 0.25   | 4       |
| LNU775                                                                                                         | 77593.3 | —                                  | —      | —       | —           | —      | —       | 93.6                             | 0.18   | 4       |
| LNU774                                                                                                         | 77246.3 | —                                  | —      | —       | 11.8        | 0.18   | 4       | —                                | —      | —       |
| LNU774                                                                                                         | 77247.2 | —                                  | —      | —       | 11.9        | 0.11   | 5       | —                                | —      | —       |
| LNU756                                                                                                         | 77581.3 | —                                  | —      | —       | —           | —      | —       | 99.9                             | 0.06   | 11      |
| LNU756                                                                                                         | 77585.4 | 1.55                               | 0.18   | 3       | —           | —      | —       | 94.7                             | 0.19   | 5       |
| CONT.                                                                                                          | —       | 1.50                               | —      | —       | 11.4        | —      | —       | 89.8                             | —      | —       |
| LNU895                                                                                                         | 77934.4 | 1.74                               | 0.07   | 21      | —           | —      | —       | 108.2                            | 0.29   | 19      |
| LNU878                                                                                                         | 77251.3 | 1.56                               | 0.10   | 8       | —           | —      | —       | —                                | —      | —       |
| LNU838                                                                                                         | 77616.3 | 1.54                               | 0.29   | 7       | —           | —      | —       | —                                | —      | —       |
| LNU811                                                                                                         | 78179.1 | 1.63                               | 0.02   | 13      | —           | —      | —       | 98.9                             | 0.15   | 9       |
| LNU808                                                                                                         | 77677.2 | 1.52                               | 0.28   | 5       | —           | —      | —       | —                                | —      | —       |
| LNU808                                                                                                         | 77677.3 | 1.54                               | 0.28   | 7       | —           | —      | —       | —                                | —      | —       |
| LNU808                                                                                                         | 77678.3 | 1.61                               | 0.05   | 12      | 11.9        | 0.09   | 6       | 104.8                            | 0.06   | 15      |
| LNU803                                                                                                         | 77902.2 | —                                  | —      | —       | 12.2        | 0.15   | 8       | —                                | —      | —       |
| LNU803                                                                                                         | 77904.4 | —                                  | —      | —       | 11.9        | 0.09   | 6       | —                                | —      | —       |
| LNU793                                                                                                         | 78169.2 | 1.57                               | 0.11   | 9       | —           | —      | —       | —                                | —      | —       |
| LNU784                                                                                                         | 77615.1 | 1.63                               | 0.12   | 13      | —           | —      | —       | 102.1                            | 0.05   | 12      |
| LNU775                                                                                                         | 77593.1 | 1.55                               | 0.22   | 8       | —           | —      | —       | —                                | —      | —       |
| LNU774                                                                                                         | 77246.3 | 1.96                               | 0.04   | 36      | —           | —      | —       | 120.5                            | 0.03   | 32      |
| LNU769                                                                                                         | 78165.2 | —                                  | —      | —       | 11.8        | 0.14   | 5       | —                                | —      | —       |
| CONT.                                                                                                          | —       | 1.44                               | —      | —       | 11.3        | —      | —       | 91.1                             | —      | —       |

Table 114:

“CONT.”—Control;

“Ave.” —Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant. The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

TABLE 115

| Genes showing improved plant performance at low Nitrogen growth conditions under regulation of At6669 promoter |         |                    |        |         |                                             |        |         |                                  |        |         |
|----------------------------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                                      | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                                                |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU940                                                                                                         | 77812.1 | 0.886              | 0.08   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU878                                                                                                         | 77251.3 | —                  | —      | —       | 13.8                                        | 0.13   | 19      | —                                | —      | —       |
| LNU878                                                                                                         | 77252.1 | —                  | —      | —       | 16.2                                        | L      | 39      | 0.597                            | 0.03   | 17      |
| LNU820                                                                                                         | 77807.2 | 0.838              | 0.28   | 11      | —                                           | —      | —       | —                                | —      | —       |
| LNU815                                                                                                         | 77492.6 | —                  | —      | —       | 13.7                                        | 0.16   | 17      | —                                | —      | —       |
| LNU815                                                                                                         | 77495.1 | —                  | —      | —       | —                                           | —      | —       | 0.562                            | 0.15   | 10      |
| LNU803                                                                                                         | 77902.2 | 0.905              | 0.04   | 19      | —                                           | —      | —       | —                                | —      | —       |
| LNU803                                                                                                         | 77902.3 | 0.855              | 0.22   | 13      | —                                           | —      | —       | —                                | —      | —       |
| LNU803                                                                                                         | 77904.4 | —                  | —      | —       | 13.7                                        | 0.14   | 18      | 0.570                            | 0.09   | 11      |
| LNU784                                                                                                         | 77612.3 | 0.905              | 0.08   | 19      | —                                           | —      | —       | —                                | —      | —       |
| LNU784                                                                                                         | 77615.7 | —                  | —      | —       | 13.2                                        | 0.27   | 13      | —                                | —      | —       |
| LNU784                                                                                                         | 77615.9 | —                  | —      | —       | 13.1                                        | 0.30   | 12      | —                                | —      | —       |
| LNU756                                                                                                         | 77581.3 | —                  | —      | —       | —                                           | —      | —       | 0.550                            | 0.28   | 7       |
| LNU756                                                                                                         | 77584.2 | 0.851              | 0.20   | 12      | —                                           | —      | —       | —                                | —      | —       |
| LNU754                                                                                                         | 77805.2 | 0.863              | 0.17   | 14      | —                                           | —      | —       | —                                | —      | —       |
| CONT.                                                                                                          | —       | 0.758              | —      | —       | 11.7                                        | —      | —       | 0.513                            | —      | —       |
| LNU895                                                                                                         | 77934.4 | —                  | —      | —       | 13.3                                        | 0.20   | 19      | 0.542                            | 0.23   | 13      |
| LNU890                                                                                                         | 78204.6 | 0.798              | 0.22   | 14      | —                                           | —      | —       | —                                | —      | —       |
| LNU811                                                                                                         | 78179.1 | —                  | —      | —       | —                                           | —      | —       | 0.542                            | 0.23   | 13      |
| LNU803                                                                                                         | 77901.2 | —                  | —      | —       | —                                           | —      | —       | 0.547                            | 0.22   | 14      |
| LNU803                                                                                                         | 77902.2 | 0.841              | 0.09   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU775                                                                                                         | 77591.2 | 0.798              | 0.23   | 14      | —                                           | —      | —       | —                                | —      | —       |
| LNU775                                                                                                         | 77593.1 | —                  | —      | —       | —                                           | —      | —       | 0.544                            | 0.23   | 13      |

TABLE 115-continued

| Genes showing improved plant performance at low Nitrogen growth conditions under regulation of At6669 promoter |         |                    |        |         |                                             |        |         |                                  |        |         |
|----------------------------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                                      | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                                                |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU774                                                                                                         | 77246.3 | —                  | —      | —       | 14.9                                        | 0.03   | 33      | 0.573                            | 0.08   | 19      |
| LNU769                                                                                                         | 78165.1 | 0.796              | 0.23   | 13      | —                                           | —      | —       | —                                | —      | —       |
| CONT.                                                                                                          | —       | 0.703              | —      | —       | 11.2                                        | —      | —       | 0.481                            | —      | —       |

Table 115:

“CONT.”—Control;

“Ave.” —Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01 p &lt; 0.1 was considered as significant. The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

TABLE 116

| Genes showing improved plant performance at low Nitrogen growth conditions under regulation of At6669 promoter |          |               |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------------------------------|----------|---------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                                                      | Event #  | Harvest Index |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                                                |          | Ave.          | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU940                                                                                                         | 77811.5  | 0.458         | 0.18   | 7       | —                               | —      | —       | —                     | —      | —       |
| LNU878                                                                                                         | 77251.3  | —             | —      | —       | 13.4                            | 0.24   | 19      | 6.05                  | 0.10   | 8       |
| LNU878                                                                                                         | 77252.1  | —             | —      | —       | 15.7                            | 0.21   | 39      | 6.61                  | 0.19   | 18      |
| LNU878                                                                                                         | 77254.3  | —             | —      | —       | 11.8                            | 0.02   | 5       | —                     | —      | —       |
| LNU838                                                                                                         | 77616.2  | 0.476         | 0.11   | 11      | —                               | —      | —       | —                     | —      | —       |
| LNU838                                                                                                         | 77617.2  | 0.472         | 0.07   | 10      | —                               | —      | —       | —                     | —      | —       |
| LNU820                                                                                                         | 77806.6  | 0.471         | 0.08   | 10      | —                               | —      | —       | —                     | —      | —       |
| LNU815                                                                                                         | 77492.2  | 0.484         | 0.03   | 13      | —                               | —      | —       | —                     | —      | —       |
| LNU815                                                                                                         | 77492.6  | —             | —      | —       | 13.1                            | 0.24   | 17      | 5.91                  | 0.28   | 5       |
| LNU815                                                                                                         | 77495.1  | —             | —      | —       | 12.4                            | 0.28   | 11      | —                     | —      | —       |
| LNU808                                                                                                         | 77678.3  | —             | —      | —       | 12.0                            | 0.04   | 7       | —                     | —      | —       |
| LNU808                                                                                                         | 77679.3  | 0.466         | 0.11   | 9       | —                               | —      | —       | —                     | —      | —       |
| LNU803                                                                                                         | 77901.2  | 0.497         | 0.01   | 16      | —                               | —      | —       | —                     | —      | —       |
| LNU803                                                                                                         | 77904.4  | —             | —      | —       | 13.2                            | L      | 18      | 6.22                  | L      | 11      |
| LNU784                                                                                                         | 77615.12 | 0.458         | 0.18   | 7       | —                               | —      | —       | —                     | —      | —       |
| LNU784                                                                                                         | 77615.7  | —             | —      | —       | 12.7                            | 0.18   | 13      | 5.98                  | 0.17   | 6       |
| LNU784                                                                                                         | 77615.9  | —             | —      | —       | 12.7                            | 0.04   | 13      | 6.05                  | L      | 8       |
| LNU779                                                                                                         | 77887.1  | —             | —      | —       | 11.7                            | 0.25   | 4       | 5.78                  | 0.20   | 3       |
| LNU779                                                                                                         | 77890.3  | 0.464         | 0.17   | 8       | —                               | —      | —       | —                     | —      | —       |
| LNU777                                                                                                         | 77573.3  | —             | —      | —       | —                               | —      | —       | 6.02                  | 0.14   | 7       |
| LNU775                                                                                                         | 77593.3  | —             | —      | —       | 11.7                            | 0.18   | 4       | —                     | —      | —       |
| LNU756                                                                                                         | 77581.3  | 0.469         | 0.26   | 10      | 12.5                            | 0.06   | 11      | —                     | —      | —       |
| LNU756                                                                                                         | 77585.3  | 0.452         | 0.28   | 6       | —                               | —      | —       | —                     | —      | —       |
| LNU756                                                                                                         | 77585.4  | —             | —      | —       | 11.8                            | 0.19   | 5       | 5.86                  | 0.03   | 4       |
| CONT.                                                                                                          | —        | 0.428         | —      | —       | 11.2                            | —      | —       | 5.61                  | —      | —       |
| LNU895                                                                                                         | 77934.4  | —             | —      | —       | 13.5                            | 0.29   | 19      | 6.18                  | 0.14   | 11      |
| LNU878                                                                                                         | 77251.1  | 0.461         | 0.27   | 6       | —                               | —      | —       | —                     | —      | —       |
| LNU878                                                                                                         | 77251.3  | —             | —      | —       | —                               | —      | —       | 5.84                  | 0.16   | 5       |
| LNU838                                                                                                         | 77620.3  | 0.464         | 0.23   | 6       | —                               | —      | —       | —                     | —      | —       |
| LNU811                                                                                                         | 78179.1  | —             | —      | —       | 12.4                            | 0.15   | 9       | 6.09                  | 0.01   | 9       |
| LNU811                                                                                                         | 78180.3  | 0.489         | 0.03   | 12      | —                               | —      | —       | —                     | —      | —       |
| LNU808                                                                                                         | 77677.5  | 0.494         | 0.06   | 13      | —                               | —      | —       | —                     | —      | —       |
| LNU808                                                                                                         | 77678.3  | —             | —      | —       | 13.1                            | 0.06   | 15      | 5.95                  | 0.11   | 7       |
| LNU797                                                                                                         | 78021.2  | 0.467         | 0.17   | 7       | —                               | —      | —       | —                     | —      | —       |
| LNU797                                                                                                         | 78025.3  | 0.485         | 0.22   | 11      | —                               | —      | —       | —                     | —      | —       |
| LNU793                                                                                                         | 78169.1  | 0.474         | 0.09   | 8       | —                               | —      | —       | —                     | —      | —       |
| LNU784                                                                                                         | 77615.1  | —             | —      | —       | 12.8                            | 0.05   | 12      | 6.06                  | 0.04   | 9       |
| LNU775                                                                                                         | 77593.1  | —             | —      | —       | —                               | —      | —       | 5.84                  | 0.19   | 5       |
| LNU774                                                                                                         | 77246.3  | —             | —      | —       | 15.1                            | 0.03   | 32      | 6.62                  | 0.13   | 19      |
| LNU774                                                                                                         | 77247.4  | 0.481         | 0.07   | 10      | —                               | —      | —       | —                     | —      | —       |
| LNU770                                                                                                         | 77922.1  | 0.499         | 0.15   | 14      | —                               | —      | —       | —                     | —      | —       |

TABLE 116-continued

| Genes showing improved plant performance at low Nitrogen growth conditions under regulation of At6669 promoter |         |               |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------------------------------|---------|---------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                                                      | Event # | Harvest Index |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                                                |         | Ave.          | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU770                                                                                                         | 77925.3 | 0.460         | 0.27   | 5       | —                               | —      | —       | —                     | —      | —       |
| LNU761                                                                                                         | 78159.1 | 0.473         | 0.10   | 8       | —                               | —      | —       | —                     | —      | —       |
| CONT.                                                                                                          | —       | 0.437         | —      | —       | 11.4                            | —      | —       | 5.58                  | —      | —       |

Table 116:

“CONT.”—Control;

“Ave.” —Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01,  $p < 0.1$  was considered as significant. The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

TABLE 117

| Genes showing improved plant performance at low Nitrogen growth conditions under regulation of At6669 promoter |         |                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                                                      | Event # | Seed Yield [mg] |        |         | 1000 Seed Weight [mg] |        |         |
|                                                                                                                |         | Ave.            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU947                                                                                                         | 77448.4 | —               | —      | —       | 26.4                  | 0.09   | 26      |
| LNU878                                                                                                         | 77252.1 | —               | —      | —       | 25.9                  | 0.08   | 23      |
| LNU878                                                                                                         | 77254.3 | —               | —      | —       | 22.6                  | 0.19   | 7       |
| LNU841                                                                                                         | 77146.1 | —               | —      | —       | 21.7                  | L      | 3       |
| LNU841                                                                                                         | 77148.1 | —               | —      | —       | 21.6                  | 0.12   | 3       |
| LNU838                                                                                                         | 77616.2 | 187.7           | 0.22   | 12      | —                     | —      | —       |
| LNU820                                                                                                         | 77807.2 | —               | —      | —       | 22.7                  | 0.12   | 8       |
| LNU820                                                                                                         | 77809.1 | —               | —      | —       | 24.4                  | 0.21   | 16      |
| LNU815                                                                                                         | 77494.1 | —               | —      | —       | 23.6                  | 0.25   | 12      |
| LNU808                                                                                                         | 77678.1 | 180.2           | 0.25   | 8       | 21.5                  | 0.25   | 3       |
| LNU808                                                                                                         | 77678.3 | —               | —      | —       | 22.8                  | L      | 9       |
| LNU808                                                                                                         | 77679.3 | 182.7           | 0.21   | 9       | —                     | —      | —       |
| LNU803                                                                                                         | 77901.2 | 182.5           | 0.22   | 9       | —                     | —      | —       |
| LNU784                                                                                                         | 77615.1 | —               | —      | —       | 22.7                  | 0.07   | 8       |
| LNU784                                                                                                         | 77615.9 | —               | —      | —       | 22.3                  | 0.13   | 6       |
| LNU779                                                                                                         | 77887.1 | 186.2           | 0.10   | 11      | —                     | —      | —       |
| LNU779                                                                                                         | 77890.3 | 187.5           | 0.19   | 12      | —                     | —      | —       |
| LNU777                                                                                                         | 77573.3 | —               | —      | —       | 22.1                  | L      | 5       |
| LNU774                                                                                                         | 77246.3 | —               | —      | —       | 23.1                  | 0.23   | 10      |
| LNU770                                                                                                         | 77922.1 | 183.6           | 0.14   | 10      | —                     | —      | —       |
| LNU756                                                                                                         | 77584.6 | —               | —      | —       | 23.0                  | 0.09   | 10      |
| CONT.                                                                                                          | —       | 167.4           | —      | —       | 21.0                  | —      | —       |
| LNU890                                                                                                         | 78202.1 | —               | —      | —       | 22.7                  | 0.17   | 13      |
| LNU878                                                                                                         | 77254.2 | 273.8           | 0.01   | 10      | —                     | —      | —       |
| LNU878                                                                                                         | 77254.3 | —               | —      | —       | 20.8                  | L      | 4       |
| LNU838                                                                                                         | 77616.3 | 262.1           | 0.13   | 5       | —                     | —      | —       |
| LNU811                                                                                                         | 78180.3 | 266.8           | 0.26   | 7       | —                     | —      | —       |
| LNU808                                                                                                         | 77678.3 | —               | —      | —       | 20.9                  | 0.03   | 4       |
| LNU803                                                                                                         | 77902.2 | —               | —      | —       | 21.8                  | 0.19   | 9       |
| LNU797                                                                                                         | 78025.2 | —               | —      | —       | 21.4                  | 0.28   | 7       |
| LNU797                                                                                                         | 78025.3 | 266.7           | 0.11   | 7       | —                     | —      | —       |
| LNU793                                                                                                         | 78169.2 | 262.4           | 0.19   | 5       | —                     | —      | —       |
| LNU775                                                                                                         | 77592.3 | —               | —      | —       | 24.0                  | 0.01   | 20      |
| LNU774                                                                                                         | 77246.3 | —               | —      | —       | 21.0                  | 0.01   | 5       |
| LNU774                                                                                                         | 77247.4 | 282.3           | 0.02   | 13      | —                     | —      | —       |
| CONT.                                                                                                          | —       | 249.0           | —      | —       | 20.0                  | —      | —       |

Table 117:

“CONT.”—Control;

“Ave.” —Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01,  $p < 0.1$  was considered as significant. The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

TABLE 118

| Genes showing improved plant performance at Normal growth conditions under regulation of At6669 promoter |          |                 |        |         |           |        |         |                         |        |         |
|----------------------------------------------------------------------------------------------------------|----------|-----------------|--------|---------|-----------|--------|---------|-------------------------|--------|---------|
| Gene Name                                                                                                | Event #  | Dry Weight [mg] |        |         | Flowering |        |         | Inflorescence Emergence |        |         |
|                                                                                                          |          | Ave.            | P-Val. | % Incr. | Ave.      | P-Val. | % Incr. | Ave.                    | P-Val. | % Incr. |
| LNU947                                                                                                   | 77446.1  | —               | —      | —       | 17.1      | 0.23   | -4      | —                       | —      | —       |
| LNU947                                                                                                   | 77447.3  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU947                                                                                                   | 77448.3  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU947                                                                                                   | 77448.4  | 831.9           | 0.14   | 5       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU895                                                                                                   | 77935.4  | 893.8           | 0.19   | 13      | —         | —      | —       | —                       | —      | —       |
| LNU878                                                                                                   | 77251.3  | 871.2           | 0.06   | 10      | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU878                                                                                                   | 77252.1  | 859.4           | 0.03   | 9       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU878                                                                                                   | 77254.3  | 884.4           | L      | 12      | —         | —      | —       | —                       | —      | —       |
| LNU841                                                                                                   | 77148.4  | —               | —      | —       | 17.1      | 0.23   | -4      | —                       | —      | —       |
| LNU820                                                                                                   | 77807.2  | 833.1           | 0.13   | 5       | —         | —      | —       | —                       | —      | —       |
| LNU815                                                                                                   | 77492.2  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU808                                                                                                   | 77678.3  | 904.3           | 0.30   | 14      | —         | —      | —       | —                       | —      | —       |
| LNU808                                                                                                   | 77679.3  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU803                                                                                                   | 77902.2  | 879.9           | 0.11   | 11      | —         | —      | —       | —                       | —      | —       |
| LNU803                                                                                                   | 77904.4  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU784                                                                                                   | 77612.3  | 970.6           | 0.21   | 23      | —         | —      | —       | —                       | —      | —       |
| LNU779                                                                                                   | 77889.3  | 836.2           | 0.12   | 6       | —         | —      | —       | —                       | —      | —       |
| LNU777                                                                                                   | 77573.3  | 893.1           | L      | 13      | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU777                                                                                                   | 77574.4  | —               | —      | —       | 17.1      | 0.23   | -4      | —                       | —      | —       |
| LNU774                                                                                                   | 77246.3  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU774                                                                                                   | 77248.2  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU756                                                                                                   | 77581.3  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| LNU756                                                                                                   | 77584.2  | 835.7           | 0.11   | 6       | —         | —      | —       | —                       | —      | —       |
| LNU756                                                                                                   | 77584.6  | 887.9           | L      | 12      | —         | —      | —       | —                       | —      | —       |
| LNU754                                                                                                   | 77801.2  | —               | —      | —       | 17.0      | 0.15   | -5      | —                       | —      | —       |
| CONT.                                                                                                    | —        | 791.6           | —      | —       | 17.9      | —      | —       | —                       | —      | —       |
| LNU895                                                                                                   | 77934.4  | 1115.6          | 0.09   | 15      | —         | —      | —       | —                       | —      | —       |
| LNU890                                                                                                   | 78202.1  | 1017.5          | 0.19   | 5       | —         | —      | —       | —                       | —      | —       |
| LNU878                                                                                                   | 77251.3  | 1237.0          | 0.01   | 28      | 22.8      | L      | -6      | 18.1                    | L      | -5      |
| LNU878                                                                                                   | 77252.1  | —               | —      | —       | 23.2      | 0.21   | -5      | 17.7                    | 0.08   | -7      |
| LNU878                                                                                                   | 77254.2  | 1026.6          | 0.24   | 6       | 23.7      | 0.03   | -3      | 18.6                    | 0.28   | -2      |
| LNU878                                                                                                   | 77254.3  | 1068.1          | 0.02   | 10      | —         | —      | —       | —                       | —      | —       |
| LNU841                                                                                                   | 77148.1  | —               | —      | —       | —         | —      | —       | 18.5                    | 0.29   | -2      |
| LNU838                                                                                                   | 77616.2  | —               | —      | —       | —         | —      | —       | 18.7                    | 0.10   | -2      |
| LNU838                                                                                                   | 77617.5  | —               | —      | —       | 23.5      | L      | -4      | —                       | —      | —       |
| LNU811                                                                                                   | 78179.1  | —               | —      | —       | 23.6      | 0.18   | -3      | 17.9                    | 0.25   | -6      |
| LNU808                                                                                                   | 77678.3  | —               | —      | —       | 22.9      | L      | -6      | 17.2                    | 0.25   | -9      |
| LNU808                                                                                                   | 77679.3  | —               | —      | —       | 23.7      | 0.02   | -3      | 18.2                    | 0.07   | -4      |
| LNU803                                                                                                   | 77902.2  | 1035.0          | 0.07   | 7       | —         | —      | —       | 18.2                    | 0.07   | -4      |
| LNU803                                                                                                   | 77904.4  | —               | —      | —       | 23.7      | 0.03   | -3      | —                       | —      | —       |
| LNU797                                                                                                   | 78025.2  | 1087.7          | L      | 12      | —         | —      | —       | —                       | —      | —       |
| LNU793                                                                                                   | 78168.1  | 1024.6          | 0.24   | 6       | —         | —      | —       | —                       | —      | —       |
| LNU793                                                                                                   | 78169.2  | —               | —      | —       | 22.1      | 0.05   | -9      | 17.3                    | 0.06   | -9      |
| LNU784                                                                                                   | 77615.12 | —               | —      | —       | 23.6      | 0.02   | -3      | 17.9                    | 0.25   | -6      |
| LNU784                                                                                                   | 77615.9  | —               | —      | —       | —         | —      | —       | 18.2                    | 0.07   | -4      |
| LNU775                                                                                                   | 77592.3  | 1193.1          | L      | 23      | 22.7      | L      | -7      | 16.6                    | L      | -13     |
| LNU775                                                                                                   | 77593.3  | —               | —      | —       | 23.2      | 0.06   | -5      | 18.7                    | 0.10   | -2      |
| LNU774                                                                                                   | 77246.3  | 1090.6          | L      | 13      | 22.0      | L      | -10     | 16.5                    | L      | -13     |
| LNU774                                                                                                   | 77247.2  | —               | —      | —       | —         | —      | —       | 18.8                    | 0.27   | -1      |
| LNU774                                                                                                   | 77247.4  | —               | —      | —       | 23.2      | 0.06   | -5      | —                       | —      | —       |
| LNU761                                                                                                   | 78159.1  | 1029.3          | 0.09   | 6       | —         | —      | —       | —                       | —      | —       |
| LNU761                                                                                                   | 78160.7  | 1050.0          | 0.23   | 9       | —         | —      | —       | —                       | —      | —       |
| LNU754                                                                                                   | 77801.2  | —               | —      | —       | 23.1      | 0.30   | -5      | —                       | —      | —       |
| CONT.                                                                                                    | —        | 967.7           | —      | —       | 24.4      | —      | —       | 19.0                    | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01,  $p < 0.1$  was considered as significant.

The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

It should be noted that a negative increment (in percentages) when found in flowering or inflorescence emergence indicates drought avoidance of the plant.

TABLE 119

| Genes showing improved plant performance at Normal growth conditions under regulation of At6669 promoter |         |                                    |        |         |             |        |         |                                  |        |         |
|----------------------------------------------------------------------------------------------------------|---------|------------------------------------|--------|---------|-------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                                | Event # | Leaf Blade Area [cm <sup>2</sup> ] |        |         | Leaf Number |        |         | Plot Coverage [cm <sup>2</sup> ] |        |         |
|                                                                                                          |         | Ave.                               | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU947                                                                                                   | 77448.4 | —                                  | —      | —       | —           | —      | —       | 107.3                            | 0.29   | 13      |
| LNU940                                                                                                   | 77812.1 | —                                  | —      | —       | 11.6        | 0.19   | 5       | —                                | —      | —       |
| LNU895                                                                                                   | 77935.4 | 1.76                               | 0.16   | 7       | 11.7        | 0.11   | 6       | 106.3                            | 0.07   | 11      |
| LNU878                                                                                                   | 77251.3 | 1.95                               | 0.27   | 19      | 11.8        | 0.05   | 6       | —                                | —      | —       |
| LNU878                                                                                                   | 77252.1 | 2.01                               | 0.18   | 22      | —           | —      | —       | 117.3                            | 0.10   | 23      |
| LNU841                                                                                                   | 77146.2 | —                                  | —      | —       | 11.9        | 0.13   | 8       | —                                | —      | —       |
| LNU820                                                                                                   | 77807.2 | —                                  | —      | —       | 11.7        | 0.07   | 6       | —                                | —      | —       |
| LNU808                                                                                                   | 77677.5 | —                                  | —      | —       | 12.1        | 0.20   | 9       | —                                | —      | —       |
| LNU803                                                                                                   | 77901.2 | 1.75                               | 0.23   | 7       | —           | —      | —       | —                                | —      | —       |
| LNU803                                                                                                   | 77902.2 | —                                  | —      | —       | 11.9        | 0.02   | 8       | —                                | —      | —       |
| LNU803                                                                                                   | 77904.4 | —                                  | —      | —       | 12.1        | 0.20   | 9       | —                                | —      | —       |
| LNU777                                                                                                   | 77573.3 | 1.85                               | 0.19   | 12      | 11.6        | 0.11   | 5       | 108.5                            | 0.26   | 14      |
| LNU777                                                                                                   | 77574.4 | —                                  | —      | —       | 11.8        | 0.29   | 7       | —                                | —      | —       |
| LNU775                                                                                                   | 77593.3 | —                                  | —      | —       | 11.6        | 0.19   | 5       | —                                | —      | —       |
| LNU774                                                                                                   | 77247.2 | —                                  | —      | —       | 11.6        | 0.19   | 5       | —                                | —      | —       |
| LNU770                                                                                                   | 77922.1 | —                                  | —      | —       | 11.4        | 0.30   | 3       | —                                | —      | —       |
| LNU770                                                                                                   | 77925.3 | —                                  | —      | —       | 11.4        | 0.30   | 3       | —                                | —      | —       |
| LNU756                                                                                                   | 77585.3 | —                                  | —      | —       | 12.1        | 0.05   | 10      | —                                | —      | —       |
| LNU754                                                                                                   | 77801.2 | —                                  | —      | —       | —           | —      | —       | 102.1                            | 0.21   | 7       |
| LNU754                                                                                                   | 77802.2 | —                                  | —      | —       | —           | —      | —       | 105.1                            | 0.25   | 10      |
| CONT.                                                                                                    | —       | 1.64                               | —      | —       | 11.1        | —      | —       | 95.3                             | —      | —       |
| LNU878                                                                                                   | 77251.3 | 1.86                               | 0.03   | 21      | 11.8        | 0.10   | 8       | 115.4                            | 0.03   | 23      |
| LNU878                                                                                                   | 77252.1 | 1.74                               | 0.13   | 13      | —           | —      | —       | 108.2                            | 0.13   | 15      |
| LNU838                                                                                                   | 77616.3 | —                                  | —      | —       | 11.2        | 0.17   | 3       | —                                | —      | —       |
| LNU838                                                                                                   | 77620.3 | —                                  | —      | —       | 11.4        | 0.07   | 4       | —                                | —      | —       |
| LNU808                                                                                                   | 77679.3 | —                                  | —      | —       | 11.5        | 0.05   | 5       | —                                | —      | —       |
| LNU803                                                                                                   | 77902.3 | —                                  | —      | —       | 11.3        | 0.24   | 4       | —                                | —      | —       |
| LNU784                                                                                                   | 77615.1 | —                                  | —      | —       | 12.0        | 0.15   | 10      | —                                | —      | —       |
| LNU775                                                                                                   | 77592.3 | 1.94                               | 0.20   | 26      | —           | —      | —       | 115.8                            | 0.11   | 23      |
| LNU774                                                                                                   | 77246.3 | 2.07                               | 0.02   | 34      | 12.1        | L      | 11      | 132.2                            | 0.09   | 41      |
| LNU774                                                                                                   | 77247.4 | —                                  | —      | —       | 11.2        | 0.23   | 3       | —                                | —      | —       |
| CONT.                                                                                                    | —       | 1.54                               | —      | —       | 10.9        | —      | —       | 94.0                             | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

TABLE 120

| Genes showing improved plant performance at Normal growth conditions under regulation of At6669 promoter |         |                    |        |         |                                             |        |         |                                  |        |         |
|----------------------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                                | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                                          |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU947                                                                                                   | 77446.1 | 0.846              | 0.15   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU947                                                                                                   | 77448.4 | 0.879              | 0.09   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU940                                                                                                   | 77811.2 | 0.810              | 0.28   | 15      | —                                           | —      | —       | —                                | —      | —       |
| LNU878                                                                                                   | 77251.1 | 0.813              | 0.28   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU878                                                                                                   | 77251.3 | —                  | —      | —       | 15.5                                        | 0.11   | 25      | —                                | —      | —       |
| LNU878                                                                                                   | 77252.1 | —                  | —      | —       | 15.2                                        | 0.12   | 23      | —                                | —      | —       |
| LNU841                                                                                                   | 77146.2 | 0.845              | 0.16   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU838                                                                                                   | 77620.3 | 0.818              | 0.24   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU820                                                                                                   | 77807.2 | 0.889              | 0.06   | 27      | —                                           | —      | —       | —                                | —      | —       |
| LNU808                                                                                                   | 77677.5 | 0.854              | 0.13   | 22      | —                                           | —      | —       | —                                | —      | —       |
| LNU803                                                                                                   | 77902.2 | 0.913              | 0.03   | 30      | —                                           | —      | —       | —                                | —      | —       |
| LNU803                                                                                                   | 77903.1 | 0.827              | 0.21   | 18      | —                                           | —      | —       | —                                | —      | —       |
| LNU779                                                                                                   | 77887.3 | 0.817              | 0.25   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU777                                                                                                   | 77574.4 | 0.843              | 0.15   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU775                                                                                                   | 77591.2 | 0.818              | 0.26   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU774                                                                                                   | 77247.2 | —                  | —      | —       | 15.9                                        | 0.09   | 28      | 0.632                            | 0.21   | 13      |

TABLE 120-continued

| Genes showing improved plant performance at Normal growth conditions under regulation of At6669 promoter |         |                    |        |         |                                             |        |         |                                  |        |         |
|----------------------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                                | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                                          |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU770                                                                                                   | 77925.3 | 0.811              | 0.26   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU756                                                                                                   | 77585.3 | 0.859              | 0.12   | 22      | —                                           | —      | —       | —                                | —      | —       |
| CONT.                                                                                                    | —       | 0.702              | —      | —       | 12.4                                        | —      | —       | 0.558                            | —      | —       |
| LNU959                                                                                                   | 78222.8 | 0.790              | 0.23   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU878                                                                                                   | 77251.3 | —                  | —      | —       | 14.2                                        | 0.22   | 21      | —                                | —      | —       |
| LNU878                                                                                                   | 77254.2 | 0.803              | 0.16   | 19      | —                                           | —      | —       | —                                | —      | —       |
| LNU811                                                                                                   | 78179.1 | 0.782              | 0.26   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU803                                                                                                   | 77901.2 | 0.820              | 0.12   | 21      | —                                           | —      | —       | —                                | —      | —       |
| LNU797                                                                                                   | 78022.1 | 0.811              | 0.12   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU797                                                                                                   | 78025.3 | 0.822              | 0.13   | 22      | —                                           | —      | —       | —                                | —      | —       |
| LNU793                                                                                                   | 78168.1 | 0.790              | 0.23   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU793                                                                                                   | 78169.2 | —                  | —      | —       | 14.3                                        | 0.28   | 22      | —                                | —      | —       |
| LNU784                                                                                                   | 77612.3 | 0.781              | 0.22   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU784                                                                                                   | 77615.1 | 0.784              | 0.25   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU775                                                                                                   | 77592.3 | —                  | —      | —       | 14.3                                        | 0.21   | 22      | —                                | —      | —       |
| LNU774                                                                                                   | 77246.3 | —                  | —      | —       | 16.5                                        | 0.03   | 40      | 0.588                            | 0.20   | 16      |
| LNU774                                                                                                   | 77247.2 | 0.812              | 0.13   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU761                                                                                                   | 78159.1 | 0.775              | 0.27   | 15      | —                                           | —      | —       | —                                | —      | —       |
| LNU754                                                                                                   | 77801.2 | 0.799              | 0.19   | 18      | —                                           | —      | —       | —                                | —      | —       |
| CONT.                                                                                                    | —       | 0.675              | —      | —       | 11.7                                        | —      | —       | 0.508                            | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

TABLE 121

| Genes showing improved plant performance at Normal growth conditions under regulation of At6669 promoter |          |               |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------------------------|----------|---------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                                                | Event #  | Harvest Index |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                                          |          | Ave.          | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU947                                                                                                   | 77448.4  | —             | —      | —       | 13.4                            | 0.29   | 13      | —                     | —      | —       |
| LNU940                                                                                                   | 77812.4  | 0.500         | 0.05   | 7       | —                               | —      | —       | —                     | —      | —       |
| LNU895                                                                                                   | 77935.4  | —             | —      | —       | 13.3                            | 0.07   | 11      | 6.22                  | 0.09   | 5       |
| LNU878                                                                                                   | 77252.1  | —             | —      | —       | 14.7                            | 0.10   | 23      | 6.58                  | 0.21   | 12      |
| LNU838                                                                                                   | 77616.2  | 0.504         | 0.02   | 8       | —                               | —      | —       | —                     | —      | —       |
| LNU815                                                                                                   | 77492.2  | 0.482         | 0.28   | 3       | —                               | —      | —       | —                     | —      | —       |
| LNU808                                                                                                   | 77677.3  | 0.488         | 0.30   | 5       | —                               | —      | —       | —                     | —      | —       |
| LNU808                                                                                                   | 77678.1  | 0.497         | 0.05   | 6       | —                               | —      | —       | —                     | —      | —       |
| LNU803                                                                                                   | 77904.4  | 0.489         | 0.29   | 5       | —                               | —      | —       | —                     | —      | —       |
| LNU784                                                                                                   | 77615.12 | 0.505         | 0.02   | 8       | —                               | —      | —       | —                     | —      | —       |
| LNU779                                                                                                   | 77887.1  | 0.512         | 0.08   | 10      | —                               | —      | —       | —                     | —      | —       |
| LNU777                                                                                                   | 77573.3  | —             | —      | —       | 13.6                            | 0.26   | 14      | 6.41                  | 0.19   | 9       |
| LNU775                                                                                                   | 77591.2  | 0.503         | 0.28   | 8       | —                               | —      | —       | —                     | —      | —       |
| LNU775                                                                                                   | 77593.3  | 0.503         | 0.03   | 8       | —                               | —      | —       | —                     | —      | —       |
| LNU775                                                                                                   | 77595.1  | 0.509         | 0.01   | 9       | —                               | —      | —       | —                     | —      | —       |
| LNU770                                                                                                   | 77922.4  | 0.499         | 0.08   | 7       | —                               | —      | —       | —                     | —      | —       |
| LNU756                                                                                                   | 77585.4  | 0.491         | 0.19   | 5       | —                               | —      | —       | —                     | —      | —       |
| LNU754                                                                                                   | 77801.2  | 0.506         | 0.26   | 8       | 12.8                            | 0.21   | 7       | 6.26                  | 0.07   | 6       |
| LNU754                                                                                                   | 77802.2  | —             | —      | —       | 13.1                            | 0.25   | 10      | —                     | —      | —       |
| CONT.                                                                                                    | —        | 0.467         | —      | —       | 11.9                            | —      | —       | 5.90                  | —      | —       |
| LNU959                                                                                                   | 78224.4  | 0.527         | 0.08   | 22      | —                               | —      | —       | —                     | —      | —       |
| LNU895                                                                                                   | 77933.2  | 0.483         | 0.07   | 12      | —                               | —      | —       | —                     | —      | —       |
| LNU890                                                                                                   | 78204.4  | 0.508         | 0.07   | 18      | —                               | —      | —       | —                     | —      | —       |
| LNU890                                                                                                   | 78204.8  | 0.519         | 0.12   | 20      | —                               | —      | —       | —                     | —      | —       |
| LNU878                                                                                                   | 77251.3  | —             | —      | —       | 14.4                            | 0.03   | 23      | 6.46                  | 0.03   | 12      |
| LNU878                                                                                                   | 77252.1  | —             | —      | —       | 13.5                            | 0.13   | 15      | 6.18                  | 0.08   | 7       |
| LNU878                                                                                                   | 77254.2  | 0.480         | 0.14   | 11      | —                               | —      | —       | —                     | —      | —       |
| LNU811                                                                                                   | 78176.8  | 0.481         | 0.04   | 11      | —                               | —      | —       | —                     | —      | —       |
| LNU808                                                                                                   | 77677.5  | 0.498         | 0.07   | 15      | —                               | —      | —       | —                     | —      | —       |

TABLE 121-continued

| Genes showing improved plant performance at Normal growth conditions under regulation of At6669 promoter |         |               |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------------------------|---------|---------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                                                | Event # | Harvest Index |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                                          |         | Ave.          | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU803                                                                                                   | 77902.3 | 0.471         | 0.08   | 9       | —                               | —      | —       | —                     | —      | —       |
| LNU803                                                                                                   | 77903.1 | 0.464         | 0.21   | 7       | —                               | —      | —       | —                     | —      | —       |
| LNU793                                                                                                   | 78166.4 | 0.483         | 0.03   | 12      | —                               | —      | —       | —                     | —      | —       |
| LNU775                                                                                                   | 77592.3 | —             | —      | —       | 14.5                            | 0.11   | 23      | 6.46                  | 0.27   | 12      |
| LNU775                                                                                                   | 77593.1 | 0.500         | 0.19   | 16      | —                               | —      | —       | —                     | —      | —       |
| LNU774                                                                                                   | 77246.3 | —             | —      | —       | 16.5                            | 0.09   | 41      | 6.75                  | 0.03   | 17      |
| LNU769                                                                                                   | 78163.4 | 0.467         | 0.19   | 8       | —                               | —      | —       | —                     | —      | —       |
| LNU769                                                                                                   | 78165.1 | 0.481         | 0.04   | 11      | —                               | —      | —       | —                     | —      | —       |
| LNU761                                                                                                   | 78157.1 | 0.533         | L      | 23      | —                               | —      | —       | —                     | —      | —       |
| LNU761                                                                                                   | 78157.6 | 0.515         | L      | 19      | —                               | —      | —       | —                     | —      | —       |
| LNU761                                                                                                   | 78160.7 | 0.471         | 0.09   | 9       | —                               | —      | —       | —                     | —      | —       |
| LNU754                                                                                                   | 77801.1 | 0.490         | 0.08   | 13      | —                               | —      | —       | —                     | —      | —       |
| LNU754                                                                                                   | 77802.2 | 0.492         | 0.02   | 14      | —                               | —      | —       | —                     | —      | —       |
| LNU754                                                                                                   | 77804.1 | 0.491         | 0.20   | 14      | —                               | —      | —       | —                     | —      | —       |
| CONT.                                                                                                    | —       | 0.432         | —      | —       | 11.7                            | —      | —       | 5.75                  | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

TABLE 122

| Genes showing improved plant performance at Normal growth conditions under regulation of At6669 promoter |         |                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                                                | Event # | Seed Yield [mg] |        |         | 1000 Seed Weight [mg] |        |         |
|                                                                                                          |         | Ave.            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU947                                                                                                   | 77447.3 | 409.8           | 0.09   | 11      | —                     | —      | —       |
| LNU947                                                                                                   | 77448.4 | —               | —      | —       | 25.7                  | 0.10   | 16      |
| LNU895                                                                                                   | 77933.2 | —               | —      | —       | 23.5                  | 0.06   | 6       |
| LNU895                                                                                                   | 77935.3 | —               | —      | —       | 23.6                  | 0.27   | 6       |
| LNU878                                                                                                   | 77251.3 | —               | —      | —       | 25.2                  | 0.24   | 13      |
| LNU878                                                                                                   | 77254.3 | 414.6           | 0.21   | 12      | 25.0                  | L      | 12      |
| LNU820                                                                                                   | 77807.2 | —               | —      | —       | 25.2                  | L      | 13      |
| LNU820                                                                                                   | 77809.1 | —               | —      | —       | 25.3                  | 0.12   | 13      |
| LNU815                                                                                                   | 77494.1 | —               | —      | —       | 24.7                  | 0.03   | 11      |
| LNU815                                                                                                   | 77495.3 | 406.0           | 0.14   | 10      | —                     | —      | —       |
| LNU808                                                                                                   | 77678.3 | —               | —      | —       | 24.5                  | 0.22   | 10      |
| LNU803                                                                                                   | 77901.2 | 395.8           | 0.20   | 7       | —                     | —      | —       |
| LNU803                                                                                                   | 77902.2 | —               | —      | —       | 24.9                  | L      | 12      |
| LNU784                                                                                                   | 77612.3 | —               | —      | —       | 23.4                  | 0.04   | 5       |
| LNU784                                                                                                   | 77615.1 | —               | —      | —       | 25.2                  | L      | 13      |
| LNU784                                                                                                   | 77615.9 | —               | —      | —       | 23.1                  | 0.10   | 4       |
| LNU779                                                                                                   | 77887.1 | 407.7           | 0.07   | 10      | 22.8                  | 0.25   | 2       |
| LNU777                                                                                                   | 77573.3 | —               | —      | —       | 27.4                  | L      | 23      |
| LNU775                                                                                                   | 77595.1 | 413.4           | 0.10   | 12      | —                     | —      | —       |
| LNU774                                                                                                   | 77246.3 | —               | —      | —       | 24.0                  | 0.02   | 8       |
| LNU774                                                                                                   | 77247.2 | 406.2           | 0.08   | 10      | —                     | —      | —       |
| LNU756                                                                                                   | 77584.6 | —               | —      | —       | 24.5                  | 0.01   | 10      |
| CONT.                                                                                                    | —       | 370.6           | —      | —       | 22.3                  | —      | —       |
| LNU959                                                                                                   | 78224.4 | 471.4           | 0.22   | 13      | —                     | —      | —       |
| LNU895                                                                                                   | 77934.4 | —               | —      | —       | 24.3                  | 0.03   | 16      |
| LNU895                                                                                                   | 77935.3 | —               | —      | —       | 22.6                  | 0.03   | 7       |
| LNU890                                                                                                   | 78202.1 | —               | —      | —       | 22.2                  | 0.04   | 5       |
| LNU890                                                                                                   | 78204.4 | 488.9           | 0.07   | 17      | —                     | —      | —       |
| LNU890                                                                                                   | 78204.8 | 560.4           | 0.05   | 34      | —                     | —      | —       |
| LNU878                                                                                                   | 77251.3 | —               | —      | —       | 24.3                  | 0.18   | 15      |
| LNU878                                                                                                   | 77252.1 | —               | —      | —       | 25.4                  | 0.08   | 21      |
| LNU878                                                                                                   | 77254.2 | 493.1           | 0.20   | 18      | —                     | —      | —       |
| LNU878                                                                                                   | 77254.3 | —               | —      | —       | 23.1                  | 0.27   | 10      |
| LNU811                                                                                                   | 78176.8 | 478.0           | 0.29   | 14      | —                     | —      | —       |
| LNU797                                                                                                   | 78021.4 | 445.1           | 0.25   | 7       | —                     | —      | —       |
| LNU797                                                                                                   | 78025.2 | —               | —      | —       | 25.2                  | 0.06   | 20      |
| LNU797                                                                                                   | 78025.3 | —               | —      | —       | 21.6                  | 0.23   | 3       |

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TABLE 122-continued

| Genes showing improved plant performance at Normal growth conditions under regulation of At6669 promoter |         |                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                                                | Event # | Seed Yield [mg] |        |         | 1000 Seed Weight [mg] |        |         |
|                                                                                                          |         | Ave.            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU793                                                                                                   | 78168.1 | —               | —      | —       | 23.3                  | L      | 11      |
| LNU784                                                                                                   | 77615.1 | —               | —      | —       | 22.5                  | 0.01   | 7       |
| LNU775                                                                                                   | 77592.3 | —               | —      | —       | 26.2                  | L      | 25      |
| LNU774                                                                                                   | 77246.3 | —               | —      | —       | 22.4                  | 0.22   | 6       |
| LNU774                                                                                                   | 77249.1 | —               | —      | —       | 23.1                  | L      | 10      |
| LNU761                                                                                                   | 78157.1 | 495.8           | 0.12   | 19      | —                     | —      | —       |
| LNU761                                                                                                   | 78157.6 | 475.0           | 0.08   | 14      | —                     | —      | —       |
| LNU761                                                                                                   | 78159.1 | 466.0           | 0.26   | 12      | —                     | —      | —       |
| LNU761                                                                                                   | 78160.7 | 493.9           | 0.01   | 18      | —                     | —      | —       |
| CONT.                                                                                                    | —       | 417.6           | —      | —       | 21.0                  | —      | —       |

"CONT."—Control;  
"Ave."—Average;  
"% Incr." = % increment;  
"p-val."—p-value;  
L means that p-value is less than 0.01, p < 0.1 was considered as significant.  
The transgenes were under the transcriptional regulation of the new At6669 promoter (SEQ ID NO: 4880).

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## Example 18

Evaluation of Transgenic *Arabidopsis* NUE, Yield and Plant Growth Rate Under Low or Normal Nitrogen Fertilization in Greenhouse Assay

Assay 2: Nitrogen Use Efficiency Measured Until Bolting Stage: plant biomass and plant growth rate at limited and optimal nitrogen concentration under greenhouse conditions—This assay follows the plant biomass formation and the rosette area growth of plants grown in the greenhouse at limiting and non-limiting nitrogen growth conditions. Transgenic *Arabidopsis* seeds were sown in agar media supplemented with ½ MS medium and a selection agent (Kanamycin). The T<sub>2</sub> transgenic seedlings were then transplanted to

1.7 trays filled with peat and perlite in a 1:1 ratio. The trays were irrigated with a solution containing nitrogen limiting conditions, which were achieved by irrigating the plants with a solution containing 1.5 mM inorganic nitrogen in the form of KNO<sub>3</sub>, supplemented with 1 mM KH<sub>2</sub>PO<sub>4</sub>, 1 mM MgSO<sub>4</sub>, 3.6 mM KCl, 2 mM CaCl<sub>2</sub> and microelements, while normal nitrogen levels were achieved by applying a solution of 6 mM inorganic nitrogen also in the form of KNO<sub>3</sub> with 1 mM KH<sub>2</sub>PO<sub>4</sub>, 1 mM MgSO<sub>4</sub>, 2 mM CaCl<sub>2</sub> and microelements. All plants were grown in the greenhouse until bolting stage. Plant biomass (the above ground tissue) was weight in directly after harvesting the rosette (plant fresh weight [FW]). Following plants were dried in an oven at 50° C. for 48 hours and weighted (plant dry weight [DW]).

Each construct is validated at its T<sub>2</sub> generation. Transgenic plants transformed with a construct conformed by an empty vector carrying the 35S promoter and the selectable marker was used as control.

The plants were analyzed for their overall size, growth rate, fresh weight and dry matter. Transgenic plants performance was compared to control plants grown in parallel under the same conditions. Mock—transgenic plants expressing the uidA reporter gene (GUS-Intron) or with no gene at all, under the same promoter were used as control.

The experiment was planned in nested randomized plot distribution. For each gene of the invention three to five independent transformation events were analyzed from each construct.

Digital imaging—A laboratory image acquisition system, which consists of a digital reflex camera (Canon EOS 300D) attached with a 55 mm focal length lens (Canon EF-S series), mounted on a reproduction device (Kaiser RS), which includes 4 light units (4×150 Watts light bulb) was used for capturing images of plant samples. The image capturing process was repeated every 2 days starting from day 1 after transplanting till day 15. Same camera, placed in a custom made iron mount, was used for capturing images of larger plants sawn in white tubs in an environmental controlled greenhouse. The tubs were square shape include 1.7 liter trays. During the capture process, the tubes were placed beneath the iron mount, while avoiding direct sun light and casting of shadows.

An image analysis system was used, which consists of a personal desktop computer (Intel P4 3.0 GHz processor) and a public domain program—ImageJ 1.39 [Java based image processing program which was developed at the U.S. National Institutes of Health and freely available on the internet at rsbweb (dot) nih (dot) gov/]. Images were captured in resolution of 10 Mega Pixels (3888×2592 pixels) and stored in a low compression JPEG (Joint Photographic Experts Group standard) format. Next, analyzed data was saved to text files and processed using the JMP statistical analysis software (SAS institute).

Leaf analysis—Using the digital analysis leaves data was calculated, including leaf number, rosette area, rosette diameter, leaf blade area.

Vegetative growth rate: the relative growth rate (RGR) of leaf number (Formula VIII described above), rosette area (Formula IX described above) and plot coverage (Formula XI, described above) are calculated using the indicated formulas.

Plant Fresh and Dry weight—On about day 80 from sowing, the plants were harvested and directly weight for the determination of the plant fresh weight (FW) and left to dry at 50° C. in a drying chamber for about 48 hours before weighting to determine plant dry weight (DW).

Statistical analyses—To identify genes conferring significantly improved tolerance to abiotic stresses, the results obtained from the transgenic plants were compared to those obtained from control plants. To identify outperforming genes and constructs, results from the independent transformation events tested were analyzed separately. Data was analyzed using Student's t-test and results were considered significant if the p value was less than 0.1. The JMP statistics software package was used (Version 5.2.1, SAS Institute Inc., Cary, N.C., USA).

The genes listed in Tables 123-124 improved plant NUE when grown at limiting nitrogen concentration levels. These genes produced larger plants with a larger photosynthetic area, biomass (fresh weight, dry weight, leaf number, rosette diameter, rosette area and plot coverage) when grown under limiting nitrogen conditions (nutrient deficiency stress) as compared to control plants grown under identical growth conditions.

TABLE 123

Genes showing improved plant biomass production at limiting nitrogen growth conditions

| Gene Name | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|-----------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
|           |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU952    | 78218.1 | —               | —      | —       | 112.3             | 0.05   | 26      | —           | —      | —       |
| LNU952    | 78218.3 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU952    | 78218.6 | —               | —      | —       | 100.0             | 0.29   | 12      | —           | —      | —       |
| LNU952    | 78219.3 | —               | —      | —       | 118.8             | 0.04   | 33      | —           | —      | —       |
| LNU945    | 78998.2 | —               | —      | —       | —                 | —      | —       | 10.9        | 0.13   | 6       |
| LNU945    | 78999.1 | —               | —      | —       | 100.0             | 0.29   | 12      | —           | —      | —       |
| LNU920    | 78507.1 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU920    | 78508.1 | —               | —      | —       | 112.5             | 0.27   | 26      | —           | —      | —       |
| LNU920    | 78508.2 | —               | —      | —       | 112.5             | 0.05   | 26      | —           | —      | —       |
| LNU916    | 78208.3 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU914    | 80516.2 | —               | —      | —       | 127.7             | 0.18   | 43      | —           | —      | —       |
| LNU911    | 80420.3 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU911    | 80420.5 | —               | —      | —       | —                 | —      | —       | 10.4        | 0.22   | 1       |
| LNU905    | 79674.3 | —               | —      | —       | 112.5             | 0.05   | 26      | —           | —      | —       |
| LNU905    | 79674.4 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU905    | 79675.3 | —               | —      | —       | 118.8             | 0.04   | 33      | —           | —      | —       |
| LNU844    | 80342.4 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU840    | 78676.1 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |

TABLE 123-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |         |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU840                                                                                 | 78676.4 | 11.2            | L      | 54      | 131.2             | 0.23   | 47      | —           | —      | —       |
| LNU840                                                                                 | 78763.6 | 9.38            | 0.09   | 29      | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU832_H2                                                                              | 80602.1 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU832_H2                                                                              | 80604.2 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU832_H2                                                                              | 80605.1 | —               | —      | —       | 107.1             | 0.19   | 20      | 10.6        | 0.05   | 3       |
| LNU819                                                                                 | 78133.3 | 8.75            | 0.06   | 20      | —                 | —      | —       | —           | —      | —       |
| LNU801                                                                                 | 78585.2 | —               | —      | —       | 100.0             | 0.29   | 12      | —           | —      | —       |
| LNU791                                                                                 | 77893.2 | —               | —      | —       | 106.2             | 0.18   | 19      | —           | —      | —       |
| LNU791                                                                                 | 77895.2 | —               | —      | —       | 100.0             | 0.29   | 12      | —           | —      | —       |
| LNU760_H1                                                                              | 80127.2 | —               | —      | —       | 131.2             | 0.23   | 47      | —           | —      | —       |
| CONT.                                                                                  | —       | 7.29            | —      | —       | 89.6              | —      | —       | 10.3        | —      | —       |
| LNU966                                                                                 | 78605.5 | 102.5           | 0.01   | 20      | 968.8             | 0.11   | 16      | 12.6        | L      | 13      |
| LNU966                                                                                 | 78605.7 | 94.4            | 0.14   | 10      | —                 | —      | —       | 11.5        | 0.14   | 3       |
| LNU941                                                                                 | 78611.1 | —               | —      | —       | —                 | —      | —       | 11.7        | 0.02   | 5       |
| LNU941                                                                                 | 78613.1 | 105.0           | L      | 23      | 1050.0            | L      | 26      | —           | —      | —       |
| LNU941                                                                                 | 78613.5 | 92.5            | 0.13   | 8       | 937.5             | 0.05   | 12      | —           | —      | —       |
| LNU941                                                                                 | 78615.3 | 91.2            | 0.20   | 7       | —                 | —      | —       | 12.2        | 0.29   | 10      |
| LNU925                                                                                 | 78991.5 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.24   | 8       |
| LNU925                                                                                 | 78992.1 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.17   | 6       |
| LNU925                                                                                 | 78992.6 | —               | —      | —       | 951.8             | 0.04   | 14      | —           | —      | —       |
| LNU922                                                                                 | 78290.1 | —               | —      | —       | 956.2             | 0.29   | 14      | —           | —      | —       |
| LNM918                                                                                 | 78433.1 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.06   | 4       |
| LNU918                                                                                 | 78433.2 | 99.4            | 0.02   | 16      | 906.2             | 0.22   | 8       | 11.8        | 0.17   | 6       |
| LNU918                                                                                 | 78433.3 | 98.1            | 0.02   | 15      | —                 | —      | —       | —           | —      | —       |
| LNU918                                                                                 | 78433.8 | —               | —      | —       | 975.0             | 0.01   | 17      | 12.1        | L      | 8       |
| LNU918                                                                                 | 78434.2 | 93.1            | 0.19   | 9       | 925.0             | 0.07   | 11      | —           | —      | —       |
| LNU915                                                                                 | 78426.1 | 107.5           | 0.20   | 26      | 1025.0            | 0.03   | 23      | —           | —      | —       |
| LNU915                                                                                 | 78427.1 | 101.4           | 0.28   | 19      | 964.3             | 0.07   | 15      | —           | —      | —       |
| LNU915                                                                                 | 78428.1 | 108.1           | 0.03   | 26      | 1056.2            | L      | 26      | 12.6        | L      | 13      |
| LNU915                                                                                 | 78428.2 | —               | —      | —       | 931.2             | 0.29   | 11      | 11.6        | 0.07   | 4       |
| LNU909                                                                                 | 78424.3 | 91.2            | 0.20   | 7       | —                 | —      | —       | 11.8        | 0.03   | 6       |
| LNU909                                                                                 | 78425.4 | —               | —      | —       | 943.8             | 0.04   | 13      | —           | —      | —       |
| LNU909                                                                                 | 78425.5 | 118.1           | 0.07   | 38      | 1062.5            | L      | 27      | 12.7        | L      | 14      |
| LNU909                                                                                 | 78425.7 | 90.6            | 0.24   | 6       | —                 | —      | —       | —           | —      | —       |
| LNU890                                                                                 | 78202.1 | —               | —      | —       | —                 | —      | —       | 12.4        | L      | 12      |
| LNU854                                                                                 | 78236.1 | 93.1            | 0.19   | 9       | —                 | —      | —       | —           | —      | —       |
| LNU854                                                                                 | 78236.3 | —               | —      | —       | 885.7             | 0.28   | 6       | —           | —      | —       |
| LNU854                                                                                 | 78238.1 | 91.9            | 0.16   | 7       | —                 | —      | —       | 11.8        | 0.22   | 6       |
| LNU854                                                                                 | 78240.1 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.23   | 4       |
| LNU849                                                                                 | 78498.3 | —               | —      | —       | 968.8             | 0.02   | 16      | —           | —      | —       |
| LNU849                                                                                 | 78498.4 | —               | —      | —       | 1018.8            | 0.02   | 22      | —           | —      | —       |
| LNU849                                                                                 | 78499.1 | 93.8            | 0.08   | 10      | —                 | —      | —       | —           | —      | —       |
| LNU849                                                                                 | 78500.1 | —               | —      | —       | 893.8             | 0.23   | 7       | —           | —      | —       |
| LNU849                                                                                 | 78500.3 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.29   | 10      |
| LNU830                                                                                 | 78741.1 | —               | —      | —       | 918.8             | 0.16   | 10      | —           | —      | —       |
| LNU830                                                                                 | 78741.3 | —               | —      | —       | 925.0             | 0.18   | 11      | 11.4        | 0.15   | 3       |
| LNU830                                                                                 | 78741.5 | —               | —      | —       | —                 | —      | —       | 13.2        | 0.27   | 19      |
| LNU824                                                                                 | 77826.1 | 100.0           | 0.02   | 17      | 956.2             | 0.02   | 14      | 12.6        | 0.28   | 13      |
| LNU824                                                                                 | 77827.2 | 110.2           | 0.12   | 29      | 974.1             | 0.01   | 17      | 11.6        | 0.07   | 4       |
| LNU824                                                                                 | 77828.4 | —               | —      | —       | 925.0             | 0.07   | 11      | 11.8        | 0.22   | 6       |
| LNU824                                                                                 | 77829.3 | 103.1           | 0.28   | 21      | 950.0             | 0.11   | 14      | 11.5        | 0.08   | 3       |
| LNU822                                                                                 | 78623.2 | 108.8           | 0.14   | 27      | 1062.5            | 0.14   | 27      | 11.9        | L      | 7       |
| LNU822                                                                                 | 78623.6 | 115.6           | L      | 35      | 1056.2            | 0.03   | 26      | 12.1        | L      | 8       |
| LNU822                                                                                 | 78623.7 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.06   | 10      |
| LNU822                                                                                 | 78625.7 | 91.2            | 0.19   | 7       | —                 | —      | —       | —           | —      | —       |
| LNU813                                                                                 | 77681.3 | 94.4            | 0.14   | 10      | 918.8             | 0.10   | 10      | —           | —      | —       |
| LNU813                                                                                 | 77682.3 | 97.5            | 0.02   | 14      | 881.2             | 0.30   | 5       | —           | —      | —       |
| LNU813                                                                                 | 77685.1 | —               | —      | —       | 918.8             | 0.08   | 10      | —           | —      | —       |
| LNU813                                                                                 | 77685.2 | 95.6            | 0.19   | 12      | —                 | —      | —       | —           | —      | —       |
| LNU806                                                                                 | 78512.7 | 98.1            | 0.20   | 15      | 918.8             | 0.10   | 10      | —           | —      | —       |
| LNU806                                                                                 | 78514.2 | —               | —      | —       | 987.5             | 0.30   | 18      | 12.8        | 0.16   | 15      |
| LNU806                                                                                 | 78515.3 | 98.8            | 0.15   | 15      | —                 | —      | —       | —           | —      | —       |
| LNU806                                                                                 | 78515.4 | —               | —      | —       | 950.0             | 0.05   | 14      | 12.5        | 0.19   | 12      |
| LNU806                                                                                 | 78515.5 | 95.6            | 0.27   | 12      | 1037.5            | 0.12   | 24      | 12.5        | 0.25   | 12      |
| LNU802                                                                                 | 80307.3 | 94.4            | 0.08   | 10      | —                 | —      | —       | —           | —      | —       |
| LNU802                                                                                 | 80309.2 | —               | —      | —       | —                 | —      | —       | 11.5        | 0.14   | 3       |
| LNU802                                                                                 | 80309.3 | 101.9           | 0.25   | 19      | 943.8             | 0.04   | 13      | 11.6        | 0.06   | 4       |
| LNU802                                                                                 | 80310.1 | 93.1            | 0.12   | 9       | 975.0             | 0.01   | 17      | —           | —      | —       |
| LNU779                                                                                 | 77887.2 | 111.2           | 0.30   | 30      | 975.0             | 0.01   | 17      | 12.2        | L      | 10      |
| LNU779                                                                                 | 77889.3 | 90.0            | 0.29   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU761                                                                                 | 78157.1 | 99.1            | 0.23   | 16      | 983.0             | 0.10   | 18      | —           | —      | —       |
| LNU761                                                                                 | 78157.6 | 96.2            | 0.06   | 13      | 925.0             | 0.07   | 11      | —           | —      | —       |

TABLE 123-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |         |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU761                                                                                 | 78160.3 | 104.4           | 0.21   | 22      | —                 | —      | —       | 12.6        | 0.07   | 13      |
| CONT.                                                                                  | —       | 85.5            | —      | —       | 835.7             | —      | —       | 11.1        | —      | —       |
| LNU970                                                                                 | 78389.7 | —               | —      | —       | —                 | —      | —       | 9.88        | 0.02   | 6       |
| LNU970                                                                                 | 78389.8 | —               | —      | —       | —                 | —      | —       | 10.2        | 0.04   | 9       |
| LNU968                                                                                 | 77919.4 | —               | —      | —       | —                 | —      | —       | 9.62        | 0.21   | 3       |
| LNU950                                                                                 | 78913.4 | —               | —      | —       | —                 | —      | —       | 9.56        | 0.22   | 3       |
| LNU934                                                                                 | 79007.5 | —               | —      | —       | —                 | —      | —       | 9.69        | 0.08   | 4       |
| LNU934                                                                                 | 79008.3 | —               | —      | —       | —                 | —      | —       | 9.56        | 0.22   | 3       |
| LNU908                                                                                 | 79736.2 | —               | —      | —       | —                 | —      | —       | 9.56        | 0.22   | 3       |
| LNU908                                                                                 | 79738.5 | —               | —      | —       | —                 | —      | —       | 9.56        | 0.22   | 3       |
| LNU843                                                                                 | 78962.4 | —               | —      | —       | —                 | —      | —       | 9.81        | 0.15   | 5       |
| LNU843                                                                                 | 78963.2 | —               | —      | —       | —                 | —      | —       | 9.62        | 0.21   | 3       |
| LNU790                                                                                 | 78886.2 | —               | —      | —       | —                 | —      | —       | 10.8        | 0.30   | 15      |
| LNU790                                                                                 | 78886.3 | —               | —      | —       | —                 | —      | —       | 9.69        | 0.24   | 4       |
| LNU790                                                                                 | 78890.3 | —               | —      | —       | —                 | —      | —       | 9.62        | 0.21   | 3       |
| CONT.                                                                                  | —       | —               | —      | —       | —                 | —      | —       | 9.32        | —      | —       |
| LNU966                                                                                 | 78604.1 | 275.0           | 0.06   | 8       | 3195.8            | 0.05   | 12      | —           | —      | —       |
| LNU966                                                                                 | 78605.5 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.26   | 8       |
| LNU942                                                                                 | 77243.2 | —               | —      | —       | —                 | —      | —       | 11.6        | L      | 6       |
| LNU941                                                                                 | 78611.1 | 272.1           | 0.14   | 7       | 3107.1            | 0.13   | 9       | —           | —      | —       |
| LNU941                                                                                 | 78614.2 | —               | —      | —       | —                 | —      | —       | 11.3        | 0.09   | 4       |
| LNU941                                                                                 | 78615.3 | 280.0           | 0.01   | 10      | 3150.0            | L      | 11      | —           | —      | —       |
| LNU922                                                                                 | 78287.3 | 276.6           | 0.19   | 8       | 3225.9            | 0.06   | 13      | 11.8        | 0.10   | 8       |
| LNU922                                                                                 | 78287.5 | 275.4           | 0.25   | 8       | —                 | —      | —       | —           | —      | —       |
| LNU922                                                                                 | 78290.1 | —               | —      | —       | 3121.4            | L      | 10      | —           | —      | —       |
| LNU922                                                                                 | 78290.7 | —               | —      | —       | 3031.2            | 0.28   | 7       | —           | —      | —       |
| LNU915                                                                                 | 78426.1 | —               | —      | —       | 2937.5            | 0.23   | 3       | —           | —      | —       |
| LNU915                                                                                 | 78427.1 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.10   | 8       |
| LNU915                                                                                 | 78428.1 | —               | —      | —       | 3191.1            | 0.25   | 12      | 11.6        | 0.14   | 6       |
| LNU915                                                                                 | 78428.2 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.01   | 6       |
| LNU909                                                                                 | 78424.3 | 267.1           | 0.23   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU909                                                                                 | 78425.5 | 266.9           | 0.13   | 5       | 3088.4            | 0.01   | 9       | —           | —      | —       |
| LNU909                                                                                 | 78425.7 | 273.1           | 0.02   | 7       | 3031.2            | 0.09   | 7       | —           | —      | —       |
| LNU868                                                                                 | 77621.5 | —               | —      | —       | —                 | —      | —       | 11.5        | 0.02   | 5       |
| LNU854                                                                                 | 78237.2 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.26   | 8       |
| LNU854                                                                                 | 78238.1 | —               | —      | —       | 3093.8            | 0.11   | 9       | —           | —      | —       |
| LNU830                                                                                 | 78741.3 | —               | —      | —       | —                 | —      | —       | 11.3        | 0.18   | 3       |
| LNU830                                                                                 | 78741.5 | —               | —      | —       | —                 | —      | —       | 11.2        | 0.23   | 2       |
| LNU824                                                                                 | 77826.1 | 266.2           | 0.16   | 4       | —                 | —      | —       | —           | —      | —       |
| LNU824                                                                                 | 77827.3 | 266.2           | 0.11   | 4       | 3000.0            | 0.07   | 6       | —           | —      | —       |
| LNU824                                                                                 | 77829.3 | —               | —      | —       | 2987.5            | 0.09   | 5       | 11.6        | 0.27   | 6       |
| LNU822                                                                                 | 78623.7 | —               | —      | —       | 3032.1            | 0.04   | 7       | —           | —      | —       |
| LNU822                                                                                 | 78625.2 | —               | —      | —       | 3012.5            | 0.06   | 6       | —           | —      | —       |
| LNU813                                                                                 | 77681.3 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.02   | 6       |
| LNU813                                                                                 | 77681.4 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.09   | 6       |
| LNU806                                                                                 | 78514.2 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.10   | 10      |
| LNU806                                                                                 | 78515.3 | —               | —      | —       | 3031.2            | 0.04   | 7       | 11.6        | 0.02   | 6       |
| LNU806                                                                                 | 78515.5 | —               | —      | —       | 2992.9            | 0.08   | 5       | —           | —      | —       |
| LNU759                                                                                 | 77236.8 | —               | —      | —       | 2950.0            | 0.18   | 4       | —           | —      | —       |
| LNU751                                                                                 | 77477.1 | —               | —      | —       | —                 | —      | —       | 12.0        | 0.25   | 10      |
| LNU751                                                                                 | 77480.1 | —               | —      | —       | 3118.8            | 0.20   | 10      | —           | —      | —       |
| CONT.                                                                                  | —       | 255.1           | —      | —       | 2842.4            | —      | —       | 10.9        | —      | —       |
| LNU948                                                                                 | 78378.1 | 83.1            | 0.02   | 17      | —                 | —      | —       | —           | —      | —       |
| LNU948                                                                                 | 78380.2 | 84.8            | 0.02   | 19      | —                 | —      | —       | —           | —      | —       |
| LNU921                                                                                 | 79063.2 | 78.6            | 0.16   | 10      | 628.6             | 0.22   | 12      | —           | —      | —       |
| LNU888                                                                                 | 78771.1 | 84.4            | 0.06   | 18      | —                 | —      | —       | 12.2        | L      | 9       |
| LNU888                                                                                 | 78772.7 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.06   | 5       |
| LNU881                                                                                 | 78372.2 | 79.4            | 0.04   | 11      | 650.0             | 0.07   | 16      | —           | —      | —       |
| LNU857                                                                                 | 78867.1 | 77.2            | 0.11   | 8       | 627.7             | 0.15   | 12      | —           | —      | —       |
| LNU816                                                                                 | 78958.4 | 78.8            | 0.12   | 11      | 618.8             | 0.22   | 10      | —           | —      | —       |
| LNU816                                                                                 | 78958.5 | 91.2            | L      | 28      | 693.8             | 0.02   | 23      | —           | —      | —       |
| LNU816                                                                                 | 78958.7 | 90.0            | L      | 26      | 718.8             | 0.01   | 28      | —           | —      | —       |
| LNU809                                                                                 | 79168.2 | —               | —      | —       | 618.8             | 0.19   | 10      | —           | —      | —       |
| LNU809                                                                                 | 79168.3 | 79.4            | 0.15   | 11      | 618.8             | 0.19   | 10      | 11.5        | 0.23   | 3       |
| LNU807                                                                                 | 79248.1 | —               | —      | —       | 625.0             | 0.15   | 11      | —           | —      | —       |
| LNU788                                                                                 | 78516.1 | 86.7            | L      | 22      | 660.7             | 0.05   | 17      | —           | —      | —       |
| LNU788                                                                                 | 78517.2 | 76.2            | 0.14   | 7       | 637.5             | 0.11   | 13      | —           | —      | —       |
| LNU788                                                                                 | 78518.1 | 87.5            | L      | 23      | 693.8             | 0.02   | 23      | —           | —      | —       |
| LNU783                                                                                 | 79178.2 | 80.0            | 0.03   | 12      | 650.0             | 0.07   | 16      | —           | —      | —       |
| LNU778                                                                                 | 78941.1 | 81.9            | 0.02   | 15      | 637.5             | 0.10   | 13      | —           | —      | —       |
| LNU778                                                                                 | 78944.2 | —               | —      | —       | —                 | —      | —       | 11.5        | 0.28   | 3       |
| LNU762                                                                                 | 79329.2 | 78.1            | 0.10   | 10      | 612.5             | 0.24   | 9       | —           | —      | —       |

TABLE 123-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |          |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|----------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event #  | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |          | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU752                                                                                 | 78153.10 | 92.5            | 0.04   | 30      | 700.0             | 0.03   | 24      | 11.6        | 0.30   | 4       |
| LNU752                                                                                 | 78155.2  | 82.2            | 0.11   | 15      | —                 | —      | —       | —           | —      | —       |
| CONT.                                                                                  | —        | 71.2            | —      | —       | 562.5             | —      | —       | 11.2        | —      | —       |
| LNU977                                                                                 | 78032.1  | 162.5           | 0.16   | 11      | —                 | —      | —       | 11.6        | 0.08   | 2       |
| LNU977                                                                                 | 78033.1  | 167.5           | 0.29   | 15      | —                 | —      | —       | —           | —      | —       |
| LNU958                                                                                 | 77687.7  | 165.0           | 0.19   | 13      | —                 | —      | —       | —           | —      | —       |
| LNU958                                                                                 | 77689.2  | 178.8           | 0.02   | 22      | 1450.0            | 0.21   | 12      | —           | —      | —       |
| LNU933                                                                                 | 78897.1  | 168.1           | 0.19   | 15      | —                 | —      | —       | —           | —      | —       |
| LNU907                                                                                 | 78872.8  | 162.1           | 0.17   | 11      | —                 | —      | —       | —           | —      | —       |
| LNU882                                                                                 | 78973.1  | —               | —      | —       | —                 | —      | —       | 11.8        | 0.10   | 4       |
| LNU880                                                                                 | 78196.1  | 180.6           | 0.01   | 24      | 1503.6            | 0.13   | 16      | —           | —      | —       |
| LNU880                                                                                 | 78197.4  | 167.9           | 0.08   | 15      | —                 | —      | —       | —           | —      | —       |
| LNU880                                                                                 | 78200.6  | 197.9           | L      | 35      | 1456.2            | 0.24   | 13      | 11.6        | 0.19   | 2       |
| LNU871                                                                                 | 78195.4  | —               | —      | —       | —                 | —      | —       | 12.2        | L      | 7       |
| LNU848                                                                                 | 77909.2  | 170.0           | 0.06   | 16      | —                 | —      | —       | —           | —      | —       |
| LNU848                                                                                 | 77909.3  | 178.1           | 0.14   | 22      | 1450.0            | 0.23   | 12      | —           | —      | —       |
| LNU847                                                                                 | 78967.2  | 197.5           | 0.02   | 35      | 1543.8            | 0.09   | 19      | 12.2        | 0.22   | 8       |
| LNU847                                                                                 | 78967.4  | —               | —      | —       | —                 | —      | —       | 11.9        | L      | 5       |
| LNU846                                                                                 | 78436.2  | —               | —      | —       | —                 | —      | —       | 12.4        | 0.09   | 9       |
| LNU846                                                                                 | 78438.2  | 184.4           | 0.13   | 26      | —                 | —      | —       | 11.9        | 0.23   | 5       |
| LNU846                                                                                 | 78439.2  | —               | —      | —       | —                 | —      | —       | 11.6        | 0.21   | 2       |
| LNU846                                                                                 | 78439.4  | —               | —      | —       | —                 | —      | —       | 12.1        | 0.08   | 6       |
| LNU845                                                                                 | 78917.3  | 194.2           | 0.10   | 33      | 1520.8            | 0.19   | 18      | —           | —      | —       |
| LNU845                                                                                 | 78917.6  | 173.1           | 0.16   | 18      | —                 | —      | —       | —           | —      | —       |
| LNU835                                                                                 | 78186.2  | 204.4           | 0.27   | 40      | 1506.2            | 0.21   | 16      | —           | —      | —       |
| LNU828                                                                                 | 77598.3  | 193.8           | 0.29   | 33      | —                 | —      | —       | 12.2        | 0.11   | 8       |
| LNU823                                                                                 | 78122.2  | 178.1           | 0.02   | 22      | —                 | —      | —       | —           | —      | —       |
| LNU823                                                                                 | 78136.4  | 166.2           | 0.12   | 14      | —                 | —      | —       | —           | —      | —       |
| LNU823                                                                                 | 78139.1  | 174.5           | 0.03   | 19      | —                 | —      | —       | —           | —      | —       |
| LNU814                                                                                 | 78953.2  | 179.4           | 0.02   | 23      | 1500.0            | 0.13   | 16      | —           | —      | —       |
| LNU814                                                                                 | 78953.3  | 177.5           | 0.02   | 21      | —                 | —      | —       | 11.9        | 0.05   | 5       |
| LNU814                                                                                 | 78954.1  | —               | —      | —       | —                 | —      | —       | 12.1        | 0.23   | 6       |
| LNU814                                                                                 | 78955.4  | 188.8           | L      | 29      | 1493.8            | 0.14   | 15      | —           | —      | —       |
| LNU772                                                                                 | 78938.1  | —               | —      | —       | —                 | —      | —       | 12.0        | 0.03   | 6       |
| LNU772                                                                                 | 78940.2  | —               | —      | —       | —                 | —      | —       | 11.8        | 0.17   | 4       |
| LNU757                                                                                 | 77485.4  | 210.6           | 0.02   | 44      | 1612.5            | 0.06   | 25      | —           | —      | —       |
| CONT.                                                                                  | —        | 146.2           | —      | —       | 1293.4            | —      | —       | 11.4        | —      | —       |
| LNU972                                                                                 | 78907.1  | —               | —      | —       | —                 | —      | —       | 11.7        | 0.08   | 6       |
| LNU972                                                                                 | 78908.2  | —               | —      | —       | —                 | —      | —       | 11.9        | 0.05   | 9       |
| LNU972                                                                                 | 78909.3  | —               | —      | —       | —                 | —      | —       | 11.9        | 0.03   | 9       |
| LNU972                                                                                 | 78910.2  | —               | —      | —       | 3500.9            | 0.13   | 21      | —           | —      | —       |
| LNU961                                                                                 | 79143.3  | 350.0           | 0.04   | 16      | 3556.2            | 0.07   | 23      | 11.6        | 0.14   | 5       |
| LNU961                                                                                 | 79145.3  | —               | —      | —       | 3562.5            | 0.02   | 23      | 11.8        | 0.15   | 8       |
| LNU958                                                                                 | 77687.2  | —               | —      | —       | —                 | —      | —       | 12.7        | 0.25   | 16      |
| LNU958                                                                                 | 77687.5  | —               | —      | —       | —                 | —      | —       | 12.1        | 0.02   | 10      |
| LNU958                                                                                 | 77689.1  | —               | —      | —       | 3200.0            | 0.20   | 10      | 12.2        | L      | 12      |
| LNU958                                                                                 | 77689.2  | —               | —      | —       | —                 | —      | —       | 11.6        | 0.28   | 5       |
| LNU948                                                                                 | 78379.4  | —               | —      | —       | —                 | —      | —       | 12.1        | 0.04   | 10      |
| LNU948                                                                                 | 78380.2  | 380.6           | 0.04   | 27      | 3618.8            | 0.01   | 25      | 12.3        | 0.05   | 12      |
| LNU948                                                                                 | 78380.3  | 358.1           | 0.24   | 19      | 3618.8            | 0.12   | 25      | —           | —      | —       |
| LNU921                                                                                 | 79061.1  | —               | —      | —       | 3163.4            | 0.26   | 9       | —           | —      | —       |
| LNU921                                                                                 | 79063.2  | —               | —      | —       | —                 | —      | —       | 12.0        | 0.14   | 9       |
| LNU921                                                                                 | 79064.3  | —               | —      | —       | —                 | —      | —       | 11.4        | 0.28   | 4       |
| LNU913                                                                                 | 78592.4  | —               | —      | —       | —                 | —      | —       | 11.9        | 0.20   | 9       |
| LNU913                                                                                 | 78593.1  | —               | —      | —       | —                 | —      | —       | 12.1        | 0.03   | 10      |
| LNU913                                                                                 | 78593.6  | —               | —      | —       | —                 | —      | —       | 12.0        | 0.14   | 9       |
| LNU912                                                                                 | 78403.2  | —               | —      | —       | —                 | —      | —       | 12.4        | L      | 13      |
| LNU912                                                                                 | 78404.1  | 342.5           | 0.28   | 14      | —                 | —      | —       | 11.7        | 0.08   | 6       |
| LNU888                                                                                 | 78772.1  | —               | —      | —       | —                 | —      | —       | 11.9        | 0.05   | 9       |
| LNU888                                                                                 | 78772.2  | —               | —      | —       | —                 | —      | —       | 11.8        | 0.07   | 8       |
| LNU888                                                                                 | 78772.7  | —               | —      | —       | —                 | —      | —       | 11.6        | 0.12   | 6       |
| LNU881                                                                                 | 78372.2  | —               | —      | —       | —                 | —      | —       | 12.5        | 0.06   | 14      |
| LNU881                                                                                 | 78373.1  | 344.4           | 0.04   | 15      | —                 | —      | —       | 12.0        | 0.14   | 9       |
| LNU881                                                                                 | 78373.2  | —               | —      | —       | —                 | —      | —       | 12.3        | 0.05   | 12      |
| LNU881                                                                                 | 78374.1  | 343.3           | 0.27   | 14      | —                 | —      | —       | —           | —      | —       |
| LNU823                                                                                 | 78136.1  | 353.8           | 0.01   | 18      | 3318.8            | 0.09   | 15      | —           | —      | —       |
| LNU823                                                                                 | 78136.4  | —               | —      | —       | —                 | —      | —       | 12.4        | 0.04   | 13      |
| LNU823                                                                                 | 78137.3  | —               | —      | —       | —                 | —      | —       | 11.5        | 0.27   | 5       |
| LNU823                                                                                 | 78139.1  | 397.1           | 0.08   | 32      | —                 | —      | —       | —           | —      | —       |
| LNU816                                                                                 | 78957.1  | —               | —      | —       | —                 | —      | —       | 11.6        | 0.12   | 6       |
| LNU816                                                                                 | 78958.4  | —               | —      | —       | —                 | —      | —       | 11.9        | 0.03   | 9       |
| LNU816                                                                                 | 78958.7  | —               | —      | —       | —                 | —      | —       | 12.8        | 0.04   | 16      |

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |          |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|----------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event #  | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |          | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU809                                                                                 | 79168.3  | —               | —      | —       | —                 | —      | —       | 11.6        | 0.14   | 5       |
| LNU809                                                                                 | 79169.2  | —               | —      | —       | 3212.5            | 0.19   | 11      | 11.6        | 0.14   | 5       |
| LNU782                                                                                 | 77441.1  | 350.0           | 0.17   | 16      | —                 | —      | —       | —           | —      | —       |
| LNU782                                                                                 | 77444.10 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.14   | 5       |
| LNU782                                                                                 | 77444.9  | —               | —      | —       | —                 | —      | —       | 12.1        | 0.08   | 10      |
| LNU772                                                                                 | 78937.4  | 335.6           | 0.13   | 12      | 3468.8            | 0.05   | 20      | —           | —      | —       |
| LNU772                                                                                 | 78938.1  | 433.1           | L      | 44      | 3181.2            | 0.23   | 10      | 13.0        | 0.08   | 18      |
| LNU772                                                                                 | 78940.2  | —               | —      | —       | —                 | —      | —       | 11.8        | 0.15   | 8       |
| LNU762                                                                                 | 79329.2  | —               | —      | —       | —                 | —      | —       | 11.9        | 0.20   | 9       |
| LNU762                                                                                 | 79330.3  | —               | —      | —       | 3287.5            | 0.12   | 13      | —           | —      | —       |
| LNU757                                                                                 | 77481.1  | —               | —      | —       | —                 | —      | —       | 11.9        | 0.04   | 8       |
| LNU757                                                                                 | 77483.2  | —               | —      | —       | —                 | —      | —       | 11.6        | 0.29   | 6       |
| LNU757                                                                                 | 77483.3  | —               | —      | —       | —                 | —      | —       | 12.3        | 0.01   | 12      |
| LNU757                                                                                 | 77485.4  | 346.9           | 0.08   | 15      | —                 | —      | —       | —           | —      | —       |
| CONT.                                                                                  | —        | 300.5           | —      | —       | 2898.0            | —      | —       | 11.0        | —      | —       |
| LNU933                                                                                 | 78897.1  | —               | —      | —       | —                 | —      | —       | 12.8        | L      | 5       |
| LNU882                                                                                 | 78973.1  | —               | —      | —       | —                 | —      | —       | 12.9        | 0.18   | 6       |
| LNU871                                                                                 | 78191.1  | —               | —      | —       | 1093.8            | 0.19   | 7       | —           | —      | —       |
| LNU871                                                                                 | 78191.3  | 163.1           | 0.27   | 10      | 1112.5            | 0.11   | 8       | —           | —      | —       |
| LNU871                                                                                 | 78195.4  | —               | —      | —       | —                 | —      | —       | 13.1        | L      | 7       |
| LNU865                                                                                 | 79761.7  | —               | —      | —       | 1162.5            | 0.02   | 13      | 13.1        | L      | 8       |
| LNU847                                                                                 | 78967.4  | —               | —      | —       | —                 | —      | —       | 13.3        | 0.22   | 9       |
| LNU835                                                                                 | 78189.1  | —               | —      | —       | —                 | —      | —       | 13.1        | 0.12   | 8       |
| LNU828                                                                                 | 77597.3  | 165.6           | 0.24   | 11      | 1131.2            | 0.18   | 10      | —           | —      | —       |
| LNU795                                                                                 | 79521.6  | —               | —      | —       | 1112.5            | 0.29   | 8       | —           | —      | —       |
| LNU766                                                                                 | 78931.2  | —               | —      | —       | —                 | —      | —       | 12.7        | 0.17   | 4       |
| LNU766                                                                                 | 78932.1  | —               | —      | —       | 1100.0            | 0.20   | 7       | —           | —      | —       |
| CONT.                                                                                  | —        | 148.6           | —      | —       | 1026.5            | —      | —       | 12.2        | —      | —       |
| LNU975                                                                                 | 80622.1  | —               | —      | —       | —                 | —      | —       | 10.5        | 0.01   | 8       |
| LNU975                                                                                 | 80624.5  | —               | —      | —       | —                 | —      | —       | 10.7        | L      | 10      |
| LNU975                                                                                 | 80625.5  | —               | —      | —       | —                 | —      | —       | 10.2        | L      | 5       |
| LNU971                                                                                 | 78391.1  | 9.38            | 0.16   | 22      | —                 | —      | —       | —           | —      | —       |
| LNU971                                                                                 | 78391.6  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.03   | 4       |
| LNU971                                                                                 | 78395.1  | —               | —      | —       | 131.2             | 0.12   | 17      | 10.1        | 0.30   | 3       |
| LNU971                                                                                 | 78395.2  | 10.7            | 0.04   | 39      | 135.7             | 0.09   | 21      | —           | —      | —       |
| LNU964                                                                                 | 80552.8  | —               | —      | —       | —                 | —      | —       | 10.0        | 0.26   | 3       |
| LNU960                                                                                 | 78599.4  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.11   | 4       |
| LNU960                                                                                 | 78600.3  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.05   | 5       |
| LNU957                                                                                 | 80435.3  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.03   | 4       |
| LNU957                                                                                 | 80437.6  | —               | —      | —       | —                 | —      | —       | 10.3        | L      | 6       |
| LNU957                                                                                 | 80437.8  | 10.0            | 0.26   | 30      | —                 | —      | —       | —           | —      | —       |
| LNU955                                                                                 | 80432.1  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.30   | 3       |
| LNU953                                                                                 | 80427.1  | 8.75            | 0.23   | 14      | —                 | —      | —       | —           | —      | —       |
| LNU953                                                                                 | 80428.1  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.08   | 3       |
| LNU953                                                                                 | 80429.1  | —               | —      | —       | —                 | —      | —       | 10.0        | 0.26   | 3       |
| LNU949                                                                                 | 80553.7  | —               | —      | —       | —                 | —      | —       | 10.3        | 0.12   | 6       |
| LNU949                                                                                 | 80557.4  | 8.75            | 0.23   | 14      | —                 | —      | —       | —           | —      | —       |
| LNU946                                                                                 | 80648.1  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.05   | 5       |
| LNU946                                                                                 | 80648.2  | 10.0            | 0.02   | 30      | —                 | —      | —       | —           | —      | —       |
| LNU946                                                                                 | 80650.2  | 9.29            | 0.21   | 21      | —                 | —      | —       | —           | —      | —       |
| LNU944                                                                                 | 79781.2  | —               | —      | —       | —                 | —      | —       | 9.94        | 0.27   | 2       |
| LNU944                                                                                 | 79781.6  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.03   | 4       |
| LNU930                                                                                 | 79771.1  | —               | —      | —       | —                 | —      | —       | 10.0        | 0.13   | 3       |
| LNU928                                                                                 | 78213.1  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.30   | 3       |
| LNU917                                                                                 | 77496.2  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.05   | 5       |
| LNU917                                                                                 | 77500.2  | —               | —      | —       | 137.5             | 0.24   | 22      | 10.1        | 0.11   | 4       |
| LNU917                                                                                 | 77500.4  | —               | —      | —       | 137.5             | 0.24   | 22      | —           | —      | —       |
| LNU917                                                                                 | 77500.6  | —               | —      | —       | —                 | —      | —       | 10.6        | L      | 8       |
| LNU906                                                                                 | 79219.5  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.18   | 4       |
| LNU904                                                                                 | 78986.5  | —               | —      | —       | —                 | —      | —       | 9.94        | 0.27   | 2       |
| LNU904                                                                                 | 78987.2  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.18   | 4       |
| LNU903                                                                                 | 80417.4  | 10.6            | 0.03   | 38      | —                 | —      | —       | —           | —      | —       |
| LNU901                                                                                 | 80474.1  | —               | —      | —       | 126.8             | 0.13   | 13      | —           | —      | —       |
| LNU901                                                                                 | 80474.5  | —               | —      | —       | —                 | —      | —       | 10.4        | 0.18   | 6       |
| LNU899                                                                                 | 79765.4  | 9.38            | 0.16   | 22      | 131.2             | 0.12   | 17      | —           | —      | —       |
| LNU899                                                                                 | 79765.5  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.18   | 4       |
| LNU899                                                                                 | 79766.3  | —               | —      | —       | —                 | —      | —       | 10.0        | 0.26   | 3       |
| LNU897                                                                                 | 80445.2  | 11.9            | 0.23   | 54      | 150.0             | L      | 33      | 11.1        | L      | 13      |
| LNU897                                                                                 | 80448.4  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.08   | 3       |
| LNU892                                                                                 | 80410.1  | —               | —      | —       | 125.0             | 0.17   | 11      | —           | —      | —       |
| LNU892                                                                                 | 80414.2  | 12.0            | L      | 55      | —                 | —      | —       | —           | —      | —       |
| LNU892                                                                                 | 80414.5  | —               | —      | —       | —                 | —      | —       | 10.3        | L      | 6       |

TABLE 123-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |          |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|----------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event #  | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |          | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU884                                                                                 | 80405.3  | —               | —      | —       | —                 | —      | —       | 10.5        | 0.26   | 8       |
| LNU884                                                                                 | 80407.1  | —               | —      | —       | —                 | —      | —       | 10.5        | L      | 8       |
| LNU884                                                                                 | 80408.2  | —               | —      | —       | 137.5             | 0.24   | 22      | 10.1        | 0.11   | 4       |
| LNU874                                                                                 | 78366.3  | 10.0            | 0.26   | 30      | —                 | —      | —       | 10.1        | 0.03   | 4       |
| LNU874                                                                                 | 78370.1  | —               | —      | —       | 162.5             | 0.27   | 44      | —           | —      | —       |
| LNU874                                                                                 | 78370.3  | —               | —      | —       | 133.9             | 0.17   | 19      | —           | —      | —       |
| LNU874                                                                                 | 78370.7  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.18   | 4       |
| LNU873                                                                                 | 80469.1  | —               | —      | —       | 125.0             | 0.17   | 11      | 10.6        | L      | 8       |
| LNU870                                                                                 | 78505.1  | 8.75            | 0.23   | 14      | 131.2             | 0.12   | 17      | —           | —      | —       |
| LNU870                                                                                 | 78505.5  | 11.2            | 0.14   | 46      | —                 | —      | —       | 10.1        | 0.30   | 3       |
| LNU867                                                                                 | 79590.3  | —               | —      | —       | —                 | —      | —       | 9.94        | 0.27   | 2       |
| LNU866                                                                                 | 80443.2  | —               | —      | —       | —                 | —      | —       | 10.3        | 0.12   | 6       |
| LNU862                                                                                 | 79758.5  | 11.2            | 0.14   | 46      | 156.2             | L      | 39      | 11.1        | L      | 13      |
| LNU856                                                                                 | 79753.3  | —               | —      | —       | —                 | —      | —       | 9.94        | 0.27   | 2       |
| LNU856                                                                                 | 79753.9  | 8.66            | 0.27   | 13      | —                 | —      | —       | 9.94        | 0.27   | 2       |
| LNU852                                                                                 | 79580.2  | 9.38            | 0.16   | 22      | —                 | —      | —       | —           | —      | —       |
| LNU831                                                                                 | 79331.7  | —               | —      | —       | 131.2             | 0.12   | 17      | 10.2        | 0.24   | 5       |
| LNU831                                                                                 | 79333.1  | 8.75            | 0.23   | 14      | —                 | —      | —       | —           | —      | —       |
| LNU831                                                                                 | 79335.2  | —               | —      | —       | —                 | —      | —       | 10.4        | L      | 7       |
| LNU829                                                                                 | 77912.3  | —               | —      | —       | —                 | —      | —       | 10.4        | L      | 6       |
| LNU829                                                                                 | 77914.1  | —               | —      | —       | —                 | —      | —       | 10.6        | 0.11   | 9       |
| LNU825                                                                                 | 77716.4  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.08   | 3       |
| LNU825                                                                                 | 77717.4  | 10.0            | 0.26   | 30      | —                 | —      | —       | —           | —      | —       |
| LNU817                                                                                 | 80596.1  | —               | —      | —       | —                 | —      | —       | 10.3        | L      | 6       |
| LNU817                                                                                 | 80596.2  | 9.38            | 0.16   | 22      | 125.0             | 0.17   | 11      | —           | —      | —       |
| LNU817                                                                                 | 80598.1  | —               | —      | —       | 125.0             | 0.17   | 11      | —           | —      | —       |
| LNU817                                                                                 | 80599.2  | 8.75            | 0.23   | 14      | —                 | —      | —       | 10.1        | 0.11   | 4       |
| LNU805                                                                                 | 80783.2  | —               | —      | —       | —                 | —      | —       | 10.0        | 0.26   | 3       |
| LNU805                                                                                 | 80784.1  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.05   | 5       |
| LNU800                                                                                 | 77896.1  | —               | —      | —       | —                 | —      | —       | 10.0        | 0.26   | 3       |
| LNU800                                                                                 | 77896.4  | —               | —      | —       | 137.5             | 0.24   | 22      | 10.2        | 0.18   | 4       |
| LNU800                                                                                 | 77900.7  | 8.75            | 0.23   | 14      | —                 | —      | —       | —           | —      | —       |
| LNU799                                                                                 | 78672.5  | —               | —      | —       | —                 | —      | —       | 10.4        | 0.18   | 6       |
| LNU799                                                                                 | 78672.7  | —               | —      | —       | 162.5             | 0.08   | 44      | —           | —      | —       |
| LNU799                                                                                 | 78674.2  | 9.38            | 0.16   | 22      | —                 | —      | —       | —           | —      | —       |
| LNU799                                                                                 | 78674.5  | —               | —      | —       | 150.0             | 0.13   | 33      | 10.2        | 0.05   | 5       |
| LNU796                                                                                 | 78235.5  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.11   | 4       |
| LNU794                                                                                 | 78522.1  | —               | —      | —       | 131.2             | 0.12   | 17      | 10.4        | 0.03   | 6       |
| LNU794                                                                                 | 78524.1  | 10.0            | 0.02   | 30      | —                 | —      | —       | —           | —      | —       |
| LNU794                                                                                 | 78524.5  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.24   | 5       |
| LNU794                                                                                 | 78525.2  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.11   | 4       |
| LNU792                                                                                 | 79161.2  | —               | —      | —       | —                 | —      | —       | 10.6        | L      | 8       |
| LNU792                                                                                 | 79162.2  | —               | —      | —       | —                 | —      | —       | 10.3        | L      | 6       |
| LNU792                                                                                 | 79215.1  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.18   | 4       |
| LNU778                                                                                 | 78943.5  | —               | —      | —       | —                 | —      | —       | 10.5        | 0.01   | 8       |
| LNU778                                                                                 | 78944.5  | 11.9            | L      | 54      | 137.5             | 0.01   | 22      | —           | —      | —       |
| LNU773                                                                                 | 80399.1  | —               | —      | —       | —                 | —      | —       | 10.4        | 0.08   | 7       |
| LNU771                                                                                 | 80077.2  | —               | —      | —       | 125.0             | 0.17   | 11      | —           | —      | —       |
| LNU763                                                                                 | 77588.2  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.24   | 5       |
| LNU763                                                                                 | 77588.6  | 10.0            | 0.26   | 30      | 125.0             | 0.17   | 11      | 10.4        | 0.08   | 7       |
| LNU758                                                                                 | 79739.10 | 10.6            | 0.03   | 38      | 150.0             | 0.13   | 33      | 11.2        | 0.12   | 15      |
| LNU758                                                                                 | 79739.5  | —               | —      | —       | —                 | —      | —       | 10.2        | 0.02   | 4       |
| LNU758                                                                                 | 79741.2  | —               | —      | —       | —                 | —      | —       | 10.1        | 0.11   | 4       |
| LNU753                                                                                 | 77141.2  | —               | —      | —       | 125.0             | 0.17   | 11      | —           | —      | —       |
| LNU753                                                                                 | 77143.3  | —               | —      | —       | —                 | —      | —       | 9.94        | 0.27   | 2       |
| LNU753                                                                                 | 77144.1  | 9.38            | 0.16   | 22      | 131.2             | 0.12   | 17      | 10.2        | 0.24   | 5       |
| LNU753                                                                                 | 77144.2  | —               | —      | —       | —                 | —      | —       | 10.0        | 0.26   | 3       |
| LNU749                                                                                 | 80792.2  | —               | —      | —       | 125.0             | 0.17   | 11      | 10.0        | 0.26   | 3       |
| CONT.                                                                                  | —        | 7.70            | —      | —       | 112.5             | —      | —       | 9.75        | —      | —       |
| LNU976                                                                                 | 78364.1  | —               | —      | —       | —                 | —      | —       | 12.9        | 0.12   | 6       |
| LNU968                                                                                 | 77919.4  | —               | —      | —       | 1231.2            | 0.03   | 8       | —           | —      | —       |
| LNU963                                                                                 | 78385.1  | —               | —      | —       | —                 | —      | —       | 12.8        | 0.07   | 6       |
| LNU950                                                                                 | 78911.3  | —               | —      | —       | 1212.5            | 0.08   | 6       | —           | —      | —       |
| LNU934                                                                                 | 79007.3  | —               | —      | —       | —                 | —      | —       | 12.8        | 0.07   | 6       |
| LNU934                                                                                 | 79008.3  | 122.1           | 0.15   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU908                                                                                 | 79736.2  | 134.4           | 0.28   | 16      | 1312.5            | 0.10   | 15      | —           | —      | —       |
| LNU893                                                                                 | 77154.4  | —               | —      | —       | —                 | —      | —       | 13.4        | L      | 10      |
| LNU885                                                                                 | 78416.5  | 125.0           | 0.05   | 8       | 1300.0            | 0.05   | 14      | —           | —      | —       |
| LNU858                                                                                 | 79587.2  | —               | —      | —       | —                 | —      | —       | 12.6        | 0.06   | 4       |
| LNU790                                                                                 | 78886.2  | —               | —      | —       | —                 | —      | —       | 12.6        | 0.22   | 4       |
| LNU790                                                                                 | 78890.1  | 134.4           | 0.06   | 16      | 1237.5            | 0.07   | 8       | 12.6        | 0.18   | 4       |
| CONT.                                                                                  | —        | 116.2           | —      | —       | 1141.1            | —      | —       | 12.1        | —      | —       |

TABLE 123-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |         |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU947                                                                                 | 77448.4 | —               | —      | —       | —                 | —      | —       | 12.7        | 0.03   | 6       |
| LNU947                                                                                 | 77449.1 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.22   | 3       |
| LNU940                                                                                 | 77811.6 | —               | —      | —       | —                 | —      | —       | 12.6        | 0.13   | 5       |
| LNU900                                                                                 | 78851.3 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.22   | 3       |
| LNU898                                                                                 | 78981.3 | —               | —      | —       | —                 | —      | —       | 12.3        | 0.26   | 2       |
| LNU898                                                                                 | 78983.4 | —               | —      | —       | —                 | —      | —       | 12.9        | 0.09   | 7       |
| LNU898                                                                                 | 78985.1 | —               | —      | —       | 1393.8            | 0.16   | 14      | —           | —      | —       |
| LNU894                                                                                 | 78282.3 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.22   | 3       |
| LNU894                                                                                 | 78283.7 | —               | —      | —       | —                 | —      | —       | 12.9        | 0.03   | 8       |
| LNU846                                                                                 | 78436.2 | —               | —      | —       | 1368.8            | 0.04   | 12      | —           | —      | —       |
| LNU846                                                                                 | 78438.2 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.22   | 3       |
| LNU846                                                                                 | 78439.4 | —               | —      | —       | 1393.8            | 0.02   | 14      | 12.9        | 0.03   | 8       |
| LNU820                                                                                 | 77806.2 | 227.0           | 0.06   | 37      | 1410.7            | 0.11   | 15      | —           | —      | —       |
| LNU820                                                                                 | 77807.2 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.11   | 4       |
| LNU820                                                                                 | 77809.1 | —               | —      | —       | 1413.4            | 0.26   | 16      | —           | —      | —       |
| LNU815                                                                                 | 77492.2 | 193.1           | 0.05   | 17      | 1343.8            | 0.21   | 10      | —           | —      | —       |
| LNU815                                                                                 | 77492.6 | —               | —      | —       | 1331.2            | 0.12   | 9       | —           | —      | —       |
| LNU815                                                                                 | 77494.1 | —               | —      | —       | 1337.5            | 0.07   | 10      | 12.9        | 0.03   | 8       |
| LNU814                                                                                 | 78953.2 | —               | —      | —       | —                 | —      | —       | 12.3        | 0.26   | 2       |
| LNU814                                                                                 | 78955.4 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.08   | 4       |
| LNU811                                                                                 | 78179.1 | —               | —      | —       | 1412.5            | 0.03   | 16      | 12.8        | 0.28   | 7       |
| LNU811                                                                                 | 78180.3 | —               | —      | —       | 1300.0            | 0.19   | 6       | —           | —      | —       |
| LNU797                                                                                 | 78022.1 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.25   | 4       |
| LNU793                                                                                 | 78166.4 | —               | —      | —       | 1325.0            | 0.23   | 8       | —           | —      | —       |
| LNU759                                                                                 | 77236.2 | —               | —      | —       | —                 | —      | —       | 12.3        | 0.26   | 2       |
| LNU756                                                                                 | 77581.3 | —               | —      | —       | —                 | —      | —       | 12.8        | 0.25   | 6       |
| LNU756                                                                                 | 77584.6 | —               | —      | —       | 1285.7            | 0.28   | 5       | —           | —      | —       |
| LNU751                                                                                 | 77477.1 | —               | —      | —       | 1416.1            | 0.09   | 16      | —           | —      | —       |
| LNU751                                                                                 | 77478.4 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.22   | 3       |
| LNU751                                                                                 | 77480.1 | —               | —      | —       | —                 | —      | —       | 12.6        | 0.04   | 5       |
| CONT.                                                                                  | —       | 165.1           | —      | —       | 1221.4            | —      | —       | 12.0        | —      | —       |
| LNU972                                                                                 | 78909.3 | —               | —      | —       | 1531.2            | 0.28   | 5       | 12.4        | 0.09   | 5       |
| LNU972                                                                                 | 78910.2 | —               | —      | —       | 1506.2            | 0.28   | 4       | —           | —      | —       |
| LNU965                                                                                 | 78360.5 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.13   | 4       |
| LNU961                                                                                 | 79143.2 | —               | —      | —       | 1568.8            | 0.30   | 8       | —           | —      | —       |
| LNU961                                                                                 | 79145.3 | —               | —      | —       | 1525.0            | 0.14   | 5       | —           | —      | —       |
| LNU943                                                                                 | 78407.2 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.26   | 3       |
| LNU943                                                                                 | 78407.4 | —               | —      | —       | 1581.2            | 0.02   | 9       | —           | —      | —       |
| LNU926                                                                                 | 78858.8 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.26   | 3       |
| LNU913                                                                                 | 78593.1 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.09   | 5       |
| LNU896                                                                                 | 78979.5 | —               | —      | —       | 1531.2            | 0.11   | 5       | —           | —      | —       |
| LNU876                                                                                 | 79596.2 | —               | —      | —       | 1525.0            | 0.18   | 5       | —           | —      | —       |
| LNU864                                                                                 | 79339.2 | 195.8           | 0.20   | 7       | 1617.0            | 0.08   | 11      | —           | —      | —       |
| LNU833                                                                                 | 78184.1 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.26   | 3       |
| LNU804                                                                                 | 78950.4 | —               | —      | —       | 1537.5            | 0.13   | 6       | —           | —      | —       |
| LNU789                                                                                 | 78891.6 | —               | —      | —       | 1766.7            | 0.30   | 22      | —           | —      | —       |
| LNU789                                                                                 | 78893.3 | —               | —      | —       | 1500.0            | 0.30   | 3       | —           | —      | —       |
| LNU768                                                                                 | 77881.3 | 194.4           | 0.26   | 6       | 1537.5            | 0.21   | 6       | —           | —      | —       |
| LNU768                                                                                 | 77883.4 | 198.1           | 0.13   | 8       | 1581.2            | 0.02   | 9       | —           | —      | —       |
| LNU764                                                                                 | 78926.1 | 214.4           | 0.28   | 17      | 1618.8            | 0.07   | 11      | 12.4        | 0.17   | 5       |
| CONT.                                                                                  | —       | 183.8           | —      | —       | 1453.6            | —      | —       | 11.7        | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

TABLE 124

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |         |                                  |        |         |                                 |        |         |                       |        |         |  |
|----------------------------------------------------------------------------------------|---------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|--|
| Gene Name                                                                              | Event # | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |  |
|                                                                                        |         | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |  |
| LNU952                                                                                 | 78218.1 | 49.8                             | 0.02   | 19      | 6.23                            | 0.02   | 19      | 4.62                  | 0.02   | 12      |  |
| LNU952                                                                                 | 78218.3 | 45.0                             | 0.24   | 7       | 5.62                            | 0.24   | 7       | 4.37                  | 0.09   | 6       |  |
| LNU952                                                                                 | 78218.6 | 46.3                             | 0.24   | 11      | 5.79                            | 0.24   | 11      | 4.33                  | 0.22   | 5       |  |
| LNU952                                                                                 | 78219.3 | 47.1                             | 0.08   | 12      | 5.88                            | 0.08   | 12      | 4.51                  | 0.04   | 9       |  |
| LNU945                                                                                 | 78998.2 | 45.8                             | 0.20   | 9       | 5.72                            | 0.20   | 9       | 4.45                  | 0.12   | 8       |  |
| LNU920                                                                                 | 78507.1 | 52.9                             | 0.08   | 26      | 6.62                            | 0.08   | 26      | 4.94                  | 0.06   | 20      |  |
| LNU920                                                                                 | 78507.2 | 45.8                             | 0.25   | 9       | 5.73                            | 0.25   | 9       | 4.35                  | 0.11   | 6       |  |
| LNU920                                                                                 | 78508.1 | 51.6                             | L      | 23      | 6.45                            | L      | 23      | 4.72                  | L      | 15      |  |
| LNU920                                                                                 | 78508.2 | 53.6                             | L      | 28      | 6.70                            | L      | 28      | 4.84                  | L      | 18      |  |
| LNU916                                                                                 | 78208.3 | 50.8                             | 0.02   | 21      | 6.35                            | 0.02   | 21      | 4.63                  | L      | 12      |  |
| LNU914                                                                                 | 80514.5 | 46.2                             | 0.15   | 10      | 5.78                            | 0.15   | 10      | 4.36                  | 0.15   | 6       |  |
| LNU914                                                                                 | 80516.2 | 50.4                             | 0.14   | 20      | 6.29                            | 0.14   | 20      | 4.71                  | L      | 14      |  |
| LNU914                                                                                 | 80516.4 | —                                | —      | —       | —                               | —      | —       | 4.50                  | 0.03   | 9       |  |
| LNU911                                                                                 | 80420.3 | 46.2                             | 0.12   | 10      | 5.77                            | 0.12   | 10      | 4.36                  | 0.09   | 6       |  |
| LNU911                                                                                 | 80424.2 | 46.3                             | 0.12   | 10      | 5.78                            | 0.12   | 10      | 4.43                  | 0.05   | 7       |  |
| LNU905                                                                                 | 79674.3 | 47.4                             | 0.08   | 13      | 5.92                            | 0.08   | 13      | 4.51                  | 0.09   | 9       |  |
| LNU905                                                                                 | 79674.4 | —                                | —      | —       | —                               | —      | —       | 4.40                  | 0.08   | 7       |  |
| LNU905                                                                                 | 79675.3 | 51.5                             | L      | 23      | 6.44                            | L      | 23      | 4.65                  | L      | 13      |  |
| LNU844                                                                                 | 80342.3 | —                                | —      | —       | —                               | —      | —       | 4.27                  | 0.27   | 4       |  |
| LNU844                                                                                 | 80342.4 | —                                | —      | —       | —                               | —      | —       | 4.32                  | 0.29   | 5       |  |
| LNU840                                                                                 | 78676.1 | 49.2                             | 0.02   | 17      | 6.15                            | 0.02   | 17      | 4.71                  | L      | 14      |  |
| LNU840                                                                                 | 78676.4 | 52.9                             | 0.09   | 26      | 6.62                            | 0.09   | 26      | 4.74                  | 0.05   | 15      |  |
| LNU840                                                                                 | 78763.6 | 46.7                             | 0.10   | 11      | 5.83                            | 0.10   | 11      | 4.45                  | 0.04   | 8       |  |
| LNU834_H1                                                                              | 80402.7 | 47.6                             | 0.21   | 14      | 5.95                            | 0.21   | 14      | 4.47                  | 0.23   | 8       |  |
| LNU832_H2                                                                              | 80604.2 | 48.2                             | 0.06   | 15      | 6.03                            | 0.06   | 15      | 4.58                  | 0.11   | 11      |  |
| LNU819                                                                                 | 78133.3 | —                                | —      | —       | —                               | —      | —       | 4.56                  | 0.02   | 11      |  |
| LNU801                                                                                 | 78585.2 | 45.6                             | 0.29   | 9       | 5.70                            | 0.29   | 9       | 4.42                  | 0.20   | 7       |  |
| LNU791                                                                                 | 77893.1 | 54.0                             | 0.01   | 29      | 6.74                            | 0.01   | 29      | 4.86                  | L      | 18      |  |
| LNU791                                                                                 | 77893.2 | 48.8                             | 0.03   | 16      | 6.09                            | 0.03   | 16      | 4.52                  | 0.04   | 10      |  |
| LNU760_H1                                                                              | 80127.2 | 51.7                             | 0.17   | 23      | 6.47                            | 0.17   | 23      | 4.65                  | 0.05   | 13      |  |
| CONT.                                                                                  | —       | 41.9                             | —      | —       | 5.24                            | —      | —       | 4.12                  | —      | —       |  |
| LNU966                                                                                 | 78605.5 | 81.2                             | 0.03   | 38      | 10.2                            | 0.03   | 38      | 5.22                  | 0.05   | 15      |  |
| LNU966                                                                                 | 78605.7 | 72.2                             | L      | 22      | 9.03                            | L      | 22      | 4.94                  | 0.01   | 9       |  |
| LNU941                                                                                 | 78611.1 | 67.9                             | L      | 15      | 8.48                            | L      | 15      | 4.67                  | 0.22   | 3       |  |
| LNU941                                                                                 | 78613.1 | 75.3                             | 0.03   | 27      | 9.41                            | 0.03   | 27      | 5.10                  | L      | 13      |  |
| LNU941                                                                                 | 78615.3 | 75.2                             | L      | 27      | 9.40                            | L      | 27      | 5.03                  | L      | 11      |  |
| LNU925                                                                                 | 78992.1 | 77.2                             | 0.26   | 31      | 9.65                            | 0.26   | 31      | 5.18                  | 0.21   | 15      |  |
| LNU925                                                                                 | 78992.6 | 62.1                             | 0.26   | 5       | 7.76                            | 0.26   | 5       | —                     | —      | —       |  |
| LNU918                                                                                 | 78433.1 | —                                | —      | —       | —                               | —      | —       | 4.73                  | 0.23   | 5       |  |
| LNU918                                                                                 | 78433.2 | 69.7                             | 0.21   | 18      | 8.72                            | 0.21   | 18      | 4.90                  | 0.23   | 8       |  |
| LNU918                                                                                 | 78433.3 | 70.2                             | L      | 19      | 8.78                            | L      | 19      | 4.85                  | 0.02   | 7       |  |
| LNU918                                                                                 | 78434.2 | 65.6                             | 0.02   | 11      | 8.21                            | 0.02   | 11      | 4.82                  | 0.03   | 6       |  |
| LNU915                                                                                 | 78426.1 | 71.3                             | L      | 21      | 8.91                            | L      | 21      | 5.05                  | L      | 12      |  |
| LNU915                                                                                 | 78427.1 | 69.8                             | 0.29   | 18      | 8.73                            | 0.29   | 18      | —                     | —      | —       |  |
| LNU915                                                                                 | 78428.1 | 78.8                             | L      | 33      | 9.85                            | L      | 33      | 5.14                  | L      | 14      |  |
| LNU915                                                                                 | 78428.2 | 66.3                             | 0.27   | 12      | 8.28                            | 0.27   | 12      | —                     | —      | —       |  |
| LNU909                                                                                 | 78424.3 | 69.3                             | 0.29   | 17      | 8.66                            | 0.29   | 17      | —                     | —      | —       |  |
| LNU909                                                                                 | 78425.4 | —                                | —      | —       | —                               | —      | —       | 5.10                  | 0.05   | 13      |  |
| LNU909                                                                                 | 78425.5 | 81.3                             | 0.25   | 38      | 10.2                            | 0.25   | 38      | 5.29                  | 0.20   | 17      |  |
| LNU909                                                                                 | 78425.7 | 67.8                             | 0.14   | 15      | 8.48                            | 0.14   | 15      | 4.83                  | 0.15   | 7       |  |
| LNU890                                                                                 | 78202.1 | 74.4                             | L      | 26      | 9.30                            | L      | 26      | 4.84                  | 0.08   | 7       |  |
| LNU854                                                                                 | 78236.1 | 62.9                             | 0.14   | 6       | 7.86                            | 0.14   | 6       | 4.67                  | 0.22   | 3       |  |
| LNU854                                                                                 | 78238.1 | 68.7                             | L      | 16      | 8.59                            | L      | 16      | 4.74                  | 0.11   | 5       |  |
| LNU849                                                                                 | 78498.4 | 72.6                             | L      | 23      | 9.08                            | L      | 23      | 4.93                  | 0.09   | 9       |  |
| LNU849                                                                                 | 78499.1 | 69.3                             | 0.04   | 17      | 8.66                            | 0.04   | 17      | 4.84                  | 0.29   | 7       |  |
| LNU830                                                                                 | 78741.5 | 79.8                             | 0.17   | 35      | 9.98                            | 0.17   | 35      | 5.18                  | 0.20   | 15      |  |
| LNU830                                                                                 | 78742.8 | 63.8                             | 0.20   | 8       | 7.97                            | 0.20   | 8       | —                     | —      | —       |  |
| LNU824                                                                                 | 77826.1 | 82.9                             | 0.20   | 40      | 10.4                            | 0.20   | 40      | 5.40                  | 0.11   | 19      |  |
| LNU824                                                                                 | 77827.3 | 64.6                             | 0.20   | 9       | 8.08                            | 0.20   | 9       | —                     | —      | —       |  |
| LNU824                                                                                 | 77828.4 | 69.4                             | 0.04   | 18      | 8.68                            | 0.04   | 18      | 4.73                  | 0.11   | 5       |  |
| LNU824                                                                                 | 77829.3 | 73.8                             | 0.05   | 25      | 9.22                            | 0.05   | 25      | 4.97                  | 0.10   | 10      |  |
| LNU822                                                                                 | 78623.2 | 82.2                             | 0.27   | 39      | 10.3                            | 0.27   | 39      | 5.29                  | 0.22   | 17      |  |
| LNU822                                                                                 | 78623.6 | 87.8                             | L      | 49      | 11.0                            | L      | 49      | 5.56                  | 0.04   | 23      |  |
| LNU822                                                                                 | 78623.7 | 74.0                             | 0.21   | 25      | 9.26                            | 0.21   | 25      | 4.96                  | 0.14   | 10      |  |
| LNU822                                                                                 | 78625.2 | 75.9                             | 0.29   | 28      | 9.48                            | 0.29   | 28      | 5.12                  | 0.25   | 13      |  |
| LNU813                                                                                 | 77682.3 | 77.3                             | 0.16   | 31      | 9.66                            | 0.16   | 31      | 5.20                  | L      | 15      |  |
| LNU806                                                                                 | 78514.2 | 87.1                             | 0.02   | 47      | 10.9                            | 0.02   | 47      | 5.61                  | L      | 24      |  |
| LNU806                                                                                 | 78515.3 | 69.3                             | L      | 17      | 8.66                            | L      | 17      | 4.75                  | 0.10   | 5       |  |
| LNU806                                                                                 | 78515.4 | —                                | —      | —       | —                               | —      | —       | 4.87                  | 0.26   | 8       |  |
| LNU806                                                                                 | 78515.5 | 76.4                             | L      | 29      | 9.55                            | L      | 29      | 4.98                  | L      | 10      |  |
| LNU802                                                                                 | 80307.3 | 65.9                             | 0.03   | 12      | 8.24                            | 0.03   | 12      | 4.68                  | 0.20   | 3       |  |

TABLE 124-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |         |                                  |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------|---------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                              | Event # | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                        |         | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU802                                                                                 | 80309.2 | 67.0                             | 0.27   | 13      | 8.38                            | 0.27   | 13      | —                     | —      | —       |
| LNU802                                                                                 | 80309.3 | 67.3                             | 0.09   | 14      | 8.41                            | 0.09   | 14      | 4.81                  | 0.04   | 6       |
| LNU802                                                                                 | 80310.1 | 67.1                             | 0.08   | 14      | 8.39                            | 0.08   | 14      | 4.81                  | 0.14   | 6       |
| LNU779                                                                                 | 77887.2 | 77.0                             | 0.03   | 30      | 9.63                            | 0.03   | 30      | 5.09                  | 0.11   | 13      |
| LNU761                                                                                 | 78157.6 | 67.8                             | 0.15   | 15      | 8.48                            | 0.15   | 15      | 4.79                  | 0.28   | 6       |
| LNU761                                                                                 | 78159.1 | 66.3                             | 0.08   | 12      | 8.29                            | 0.08   | 12      | 4.75                  | 0.08   | 5       |
| LNU761                                                                                 | 78160.3 | 84.0                             | 0.07   | 42      | 10.5                            | 0.07   | 42      | 5.44                  | 0.02   | 20      |
| CONT.                                                                                  | —       | 59.1                             | —      | —       | 7.38                            | —      | —       | 4.52                  | —      | —       |
| LNU976                                                                                 | 78364.1 | 45.6                             | L      | 47      | 5.71                            | L      | 47      | 4.19                  | L      | 25      |
| LNU976                                                                                 | 78364.2 | 34.1                             | 0.22   | 10      | 4.27                            | 0.22   | 10      | —                     | —      | —       |
| LNU976                                                                                 | 78364.5 | —                                | —      | —       | —                               | —      | —       | 3.50                  | 0.26   | 4       |
| LNU970                                                                                 | 78388.1 | 36.2                             | 0.02   | 17      | 4.52                            | 0.02   | 17      | 3.63                  | 0.03   | 8       |
| LNU970                                                                                 | 78389.7 | 33.4                             | 0.27   | 8       | 4.18                            | 0.27   | 8       | 3.62                  | 0.06   | 8       |
| LNU970                                                                                 | 78389.8 | 44.2                             | 0.03   | 42      | 5.52                            | 0.03   | 42      | 4.00                  | L      | 19      |
| LNU968                                                                                 | 77919.4 | 36.5                             | 0.01   | 18      | 4.57                            | 0.01   | 18      | 3.66                  | 0.02   | 9       |
| LNU963                                                                                 | 78383.4 | 36.6                             | 0.07   | 18      | 4.57                            | 0.07   | 18      | 3.65                  | 0.27   | 9       |
| LNU950                                                                                 | 78913.4 | 39.1                             | 0.12   | 26      | 4.89                            | 0.12   | 26      | 3.74                  | 0.18   | 11      |
| LNU950                                                                                 | 78915.2 | 35.7                             | 0.03   | 15      | 4.46                            | 0.03   | 15      | 3.66                  | 0.04   | 9       |
| LNU949                                                                                 | 80553.5 | 37.5                             | 0.22   | 21      | 4.69                            | 0.22   | 21      | 3.74                  | 0.21   | 11      |
| LNU949                                                                                 | 80553.8 | 39.6                             | 0.01   | 28      | 4.95                            | 0.01   | 28      | 3.69                  | 0.16   | 10      |
| LNU934                                                                                 | 79007.5 | 33.2                             | 0.27   | 7       | 4.16                            | 0.27   | 7       | —                     | —      | —       |
| LNU934                                                                                 | 79008.1 | 33.9                             | 0.14   | 9       | 4.24                            | 0.14   | 9       | 3.64                  | 0.15   | 8       |
| LNU902                                                                                 | 79606.5 | 38.2                             | 0.03   | 23      | 4.77                            | 0.03   | 23      | 3.77                  | 0.10   | 12      |
| LNU875                                                                                 | 78413.4 | 36.3                             | 0.29   | 17      | 4.54                            | 0.29   | 17      | 3.68                  | 0.22   | 9       |
| LNU873                                                                                 | 80473.4 | —                                | —      | —       | —                               | —      | —       | 3.73                  | 0.27   | 11      |
| LNU843                                                                                 | 78962.4 | 37.7                             | L      | 22      | 4.71                            | L      | 22      | 3.67                  | 0.02   | 9       |
| LNU843                                                                                 | 78963.2 | 36.3                             | 0.11   | 17      | 4.53                            | 0.11   | 17      | 3.68                  | 0.08   | 9       |
| LNU790                                                                                 | 78886.2 | 40.8                             | L      | 31      | 5.10                            | L      | 31      | 3.72                  | 0.08   | 11      |
| LNU790                                                                                 | 78886.3 | 35.0                             | 0.04   | 13      | 4.38                            | 0.04   | 13      | 3.67                  | 0.07   | 9       |
| LNU790                                                                                 | 78889.2 | —                                | —      | —       | —                               | —      | —       | 3.59                  | 0.07   | 7       |
| LNU767                                                                                 | 79146.1 | 41.6                             | 0.09   | 34      | 5.20                            | 0.09   | 34      | 3.85                  | 0.15   | 15      |
| LNU767                                                                                 | 79146.2 | 36.5                             | 0.01   | 18      | 4.57                            | 0.01   | 18      | 3.72                  | L      | 11      |
| CONT.                                                                                  | —       | 31.0                             | —      | —       | 3.88                            | —      | —       | 3.36                  | —      | —       |
| LNU941                                                                                 | 78613.1 | 107.3                            | 0.04   | 19      | 13.4                            | 0.04   | 19      | 6.23                  | 0.02   | 11      |
| LNU941                                                                                 | 78614.2 | 111.8                            | 0.01   | 24      | 14.0                            | 0.01   | 24      | 6.25                  | 0.02   | 12      |
| LNU941                                                                                 | 78615.3 | 102.4                            | 0.13   | 13      | 12.8                            | 0.13   | 13      | 6.03                  | 0.15   | 8       |
| LNU918                                                                                 | 78433.3 | —                                | —      | —       | —                               | —      | —       | 5.92                  | 0.16   | 6       |
| LNU915                                                                                 | 78427.1 | 104.1                            | 0.06   | 15      | 13.0                            | 0.06   | 15      | 5.92                  | 0.17   | 6       |
| LNU915                                                                                 | 78428.1 | 101.4                            | 0.24   | 12      | 12.7                            | 0.24   | 12      | —                     | —      | —       |
| LNU909                                                                                 | 78425.5 | 99.4                             | 0.26   | 10      | 12.4                            | 0.26   | 10      | —                     | —      | —       |
| LNU868                                                                                 | 77621.5 | —                                | —      | —       | —                               | —      | —       | 6.06                  | 0.25   | 8       |
| LNU854                                                                                 | 78237.2 | 114.2                            | L      | 26      | 14.3                            | L      | 26      | 6.00                  | 0.20   | 7       |
| LNU849                                                                                 | 78498.3 | —                                | —      | —       | —                               | —      | —       | 6.09                  | 0.10   | 9       |
| LNU849                                                                                 | 78498.4 | 105.0                            | 0.05   | 16      | 13.1                            | 0.05   | 16      | 5.99                  | 0.10   | 7       |
| LNU830                                                                                 | 78741.3 | —                                | —      | —       | 12.3                            | 0.26   | 9       | —                     | —      | —       |
| LNU830                                                                                 | 78741.5 | 107.9                            | 0.09   | 19      | 13.5                            | 0.09   | 19      | 6.26                  | 0.02   | 12      |
| LNU813                                                                                 | 77682.3 | —                                | —      | —       | —                               | —      | —       | 5.88                  | 0.28   | 5       |
| LNU813                                                                                 | 77685.1 | 109.6                            | 0.02   | 21      | 13.7                            | 0.02   | 21      | 6.28                  | 0.12   | 12      |
| LNU806                                                                                 | 78514.2 | 100.4                            | 0.28   | 11      | 12.6                            | 0.28   | 11      | 5.86                  | 0.29   | 5       |
| LNU806                                                                                 | 78515.3 | 100.7                            | 0.13   | 11      | 12.6                            | 0.13   | 11      | 5.93                  | 0.15   | 6       |
| LNU806                                                                                 | 78515.5 | 101.9                            | 0.15   | 13      | 12.7                            | 0.15   | 13      | 5.96                  | 0.11   | 6       |
| LNU780                                                                                 | 77489.4 | —                                | —      | —       | —                               | —      | —       | 6.04                  | 0.24   | 8       |
| CONT.                                                                                  | —       | 90.5                             | —      | —       | 11.3                            | —      | —       | 5.60                  | —      | —       |
| LNU948                                                                                 | 78378.1 | 74.9                             | 0.04   | 20      | 9.36                            | 0.04   | 20      | 5.02                  | 0.18   | 8       |
| LNU948                                                                                 | 78380.2 | 67.9                             | 0.07   | 9       | 8.49                            | 0.07   | 9       | 4.84                  | 0.22   | 5       |
| LNU921                                                                                 | 79063.2 | 64.6                             | 0.28   | 4       | 8.07                            | 0.28   | 4       | —                     | —      | —       |
| LNU889                                                                                 | 79601.4 | 67.5                             | 0.08   | 8       | 8.44                            | 0.08   | 8       | 4.83                  | 0.19   | 4       |
| LNU888                                                                                 | 78771.1 | 75.6                             | 0.22   | 21      | 9.45                            | 0.22   | 21      | 5.13                  | 0.29   | 11      |
| LNU881                                                                                 | 78372.2 | 71.0                             | 0.07   | 14      | 8.87                            | 0.07   | 14      | 4.95                  | 0.07   | 7       |
| LNU857                                                                                 | 78867.2 | 69.8                             | 0.27   | 12      | 8.72                            | 0.27   | 12      | 4.95                  | 0.27   | 7       |
| LNU857                                                                                 | 78870.1 | —                                | —      | —       | —                               | —      | —       | 4.77                  | 0.22   | 3       |
| LNU816                                                                                 | 78958.5 | 75.0                             | L      | 20      | 9.37                            | L      | 20      | 5.17                  | L      | 12      |
| LNU816                                                                                 | 78958.7 | 76.6                             | 0.03   | 23      | 9.58                            | 0.03   | 23      | 5.22                  | L      | 13      |
| LNU809                                                                                 | 79168.2 | 72.6                             | 0.24   | 16      | 9.07                            | 0.24   | 16      | 4.98                  | 0.20   | 8       |
| LNU809                                                                                 | 79168.3 | 67.9                             | 0.26   | 9       | 8.49                            | 0.26   | 9       | —                     | —      | —       |
| LNU807                                                                                 | 79248.1 | 66.3                             | 0.13   | 6       | 8.28                            | 0.13   | 6       | 4.81                  | 0.10   | 4       |
| LNU807                                                                                 | 79250.2 | 65.0                             | 0.22   | 4       | 8.13                            | 0.22   | 4       | —                     | —      | —       |
| LNU795                                                                                 | 79525.1 | 70.5                             | 0.01   | 13      | 8.82                            | 0.01   | 13      | —                     | —      | —       |
| LNU795                                                                                 | 79525.5 | 66.0                             | 0.15   | 6       | 8.25                            | 0.15   | 6       | 4.80                  | 0.11   | 4       |
| LNU788                                                                                 | 78516.1 | 76.3                             | 0.07   | 22      | 9.54                            | 0.07   | 22      | 5.11                  | 0.30   | 10      |
| LNU788                                                                                 | 78517.2 | 66.7                             | 0.07   | 7       | 8.34                            | 0.07   | 7       | 4.86                  | 0.06   | 5       |

TABLE 124-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |          |                                  |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------|----------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                              | Event #  | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                        |          | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU788                                                                                 | 78518.1  | 89.3                             | 0.11   | 43      | 11.2                            | 0.11   | 43      | 5.59                  | L      | 21      |
| LNU778                                                                                 | 78941.1  | 72.6                             | 0.15   | 16      | 9.07                            | 0.15   | 16      | 4.94                  | 0.16   | 7       |
| LNU778                                                                                 | 78944.2  | 70.0                             | 0.01   | 12      | 8.75                            | 0.01   | 12      | 4.90                  | 0.16   | 6       |
| LNU752                                                                                 | 78153.10 | 75.8                             | 0.26   | 22      | 9.48                            | 0.26   | 22      | 5.24                  | 0.16   | 13      |
| LNU752                                                                                 | 78155.2  | 64.9                             | 0.29   | 4       | 8.11                            | 0.29   | 4       | 4.83                  | 0.26   | 4       |
| CONT.                                                                                  | —        | 62.3                             | —      | —       | 7.79                            | —      | —       | 4.63                  | —      | —       |
| LNU977                                                                                 | 78032.1  | 89.1                             | 0.28   | 11      | —                               | —      | —       | —                     | —      | —       |
| LNU933                                                                                 | 78897.1  | —                                | —      | —       | —                               | —      | —       | 5.57                  | 0.24   | 6       |
| LNU880                                                                                 | 78197.2  | 85.7                             | 0.28   | 7       | —                               | —      | —       | —                     | —      | —       |
| LNU871                                                                                 | 78195.4  | 90.4                             | 0.07   | 12      | 11.3                            | 0.11   | 10      | 5.46                  | 0.23   | 4       |
| LNU848                                                                                 | 77906.2  | —                                | —      | —       | —                               | —      | —       | 5.58                  | 0.06   | 6       |
| LNU847                                                                                 | 78967.2  | 87.7                             | 0.07   | 9       | 11.0                            | 0.14   | 7       | 5.39                  | 0.20   | 2       |
| LNU846                                                                                 | 78438.2  | —                                | —      | —       | —                               | —      | —       | 5.53                  | 0.12   | 5       |
| LNU846                                                                                 | 78439.2  | —                                | —      | —       | —                               | —      | —       | 5.52                  | 0.22   | 5       |
| LNU846                                                                                 | 78439.4  | 105.8                            | L      | 32      | 13.2                            | L      | 29      | 6.04                  | L      | 15      |
| LNU828                                                                                 | 77598.3  | 96.6                             | 0.17   | 20      | 12.1                            | 0.20   | 18      | 5.85                  | 0.10   | 11      |
| LNU823                                                                                 | 78122.2  | 90.5                             | 0.25   | 13      | —                               | —      | —       | 5.62                  | 0.30   | 7       |
| LNU772                                                                                 | 78938.1  | 105.8                            | 0.14   | 32      | 13.2                            | 0.15   | 29      | 6.10                  | 0.26   | 16      |
| LNU757                                                                                 | 77485.4  | 93.2                             | L      | 16      | 11.7                            | 0.01   | 14      | 5.63                  | 0.08   | 7       |
| CONT.                                                                                  | —        | 80.4                             | —      | —       | 10.2                            | —      | —       | 5.26                  | —      | —       |
| LNU972                                                                                 | 78907.1  | 79.1                             | 0.15   | 21      | 9.89                            | 0.15   | 21      | 5.43                  | 0.24   | 9       |
| LNU972                                                                                 | 78908.2  | 77.3                             | 0.06   | 18      | 9.66                            | 0.06   | 18      | 5.40                  | L      | 8       |
| LNU972                                                                                 | 78909.3  | 88.0                             | 0.12   | 35      | 11.0                            | 0.12   | 35      | 5.78                  | 0.09   | 16      |
| LNU961                                                                                 | 79143.3  | 78.3                             | 0.01   | 20      | 9.79                            | 0.01   | 20      | 5.51                  | L      | 10      |
| LNU961                                                                                 | 79143.4  | 72.6                             | 0.13   | 11      | 9.07                            | 0.13   | 11      | 5.42                  | 0.05   | 9       |
| LNU961                                                                                 | 79145.3  | 79.1                             | 0.01   | 21      | 9.89                            | 0.01   | 21      | 5.38                  | L      | 8       |
| LNU961                                                                                 | 79145.6  | 70.6                             | 0.24   | 8       | 8.83                            | 0.24   | 8       | 5.14                  | 0.19   | 3       |
| LNU958                                                                                 | 77687.2  | 87.1                             | L      | 33      | 10.9                            | L      | 33      | 5.75                  | L      | 15      |
| LNU958                                                                                 | 77687.5  | 83.6                             | L      | 28      | 10.5                            | L      | 28      | 5.72                  | L      | 15      |
| LNU958                                                                                 | 77689.1  | 84.4                             | L      | 29      | 10.6                            | L      | 29      | 5.76                  | L      | 16      |
| LNU958                                                                                 | 77689.2  | 76.8                             | 0.15   | 17      | 9.59                            | 0.15   | 17      | 5.37                  | 0.22   | 8       |
| LNU948                                                                                 | 78378.1  | 83.1                             | L      | 27      | 10.4                            | L      | 27      | 5.66                  | L      | 13      |
| LNU948                                                                                 | 78379.4  | 77.8                             | 0.19   | 19      | 9.73                            | 0.19   | 19      | —                     | —      | —       |
| LNU948                                                                                 | 78380.2  | 84.5                             | L      | 29      | 10.6                            | L      | 29      | 5.64                  | L      | 13      |
| LNU948                                                                                 | 78380.3  | 71.6                             | 0.27   | 9       | 8.95                            | 0.27   | 9       | 5.21                  | 0.09   | 5       |
| LNU921                                                                                 | 79063.2  | 82.4                             | L      | 26      | 10.3                            | L      | 26      | 5.53                  | L      | 11      |
| LNU921                                                                                 | 79064.2  | —                                | —      | —       | —                               | —      | —       | 5.25                  | 0.05   | 5       |
| LNU921                                                                                 | 79064.3  | 74.3                             | 0.14   | 14      | 9.28                            | 0.14   | 14      | 5.34                  | 0.07   | 7       |
| LNU913                                                                                 | 78592.1  | 79.5                             | L      | 22      | 9.94                            | L      | 22      | 5.36                  | 0.01   | 7       |
| LNU913                                                                                 | 78592.3  | 77.5                             | 0.14   | 18      | 9.69                            | 0.14   | 18      | 5.39                  | 0.21   | 8       |
| LNU913                                                                                 | 78592.4  | 86.6                             | L      | 32      | 10.8                            | L      | 32      | 5.73                  | 0.07   | 15      |
| LNU913                                                                                 | 78593.1  | 86.4                             | L      | 32      | 10.8                            | L      | 32      | 5.63                  | L      | 13      |
| LNU913                                                                                 | 78593.6  | 92.6                             | L      | 42      | 11.6                            | L      | 42      | 5.96                  | L      | 20      |
| LNU912                                                                                 | 78401.3  | —                                | —      | —       | —                               | —      | —       | 5.25                  | 0.18   | 5       |
| LNU912                                                                                 | 78403.2  | 83.9                             | 0.06   | 28      | 10.5                            | 0.06   | 28      | 5.70                  | 0.06   | 14      |
| LNU912                                                                                 | 78404.1  | 80.3                             | L      | 23      | 10.0                            | L      | 23      | 5.44                  | L      | 9       |
| LNU889                                                                                 | 79601.4  | 76.4                             | 0.03   | 17      | 9.55                            | 0.03   | 17      | 5.42                  | L      | 9       |
| LNU889                                                                                 | 79602.4  | —                                | —      | —       | —                               | —      | —       | 5.27                  | 0.21   | 6       |
| LNU881                                                                                 | 78372.2  | 91.4                             | L      | 40      | 11.4                            | L      | 40      | 5.88                  | L      | 18      |
| LNU881                                                                                 | 78373.1  | 73.9                             | 0.14   | 13      | 9.24                            | 0.14   | 13      | —                     | —      | —       |
| LNU881                                                                                 | 78373.2  | 91.7                             | L      | 40      | 11.5                            | L      | 40      | 5.96                  | 0.01   | 19      |
| LNU823                                                                                 | 78136.4  | 87.2                             | L      | 33      | 10.9                            | L      | 33      | 5.68                  | 0.05   | 14      |
| LNU816                                                                                 | 78957.1  | 76.3                             | 0.04   | 17      | 9.54                            | 0.04   | 17      | 5.42                  | 0.02   | 9       |
| LNU816                                                                                 | 78958.4  | 86.4                             | L      | 32      | 10.8                            | L      | 32      | 5.60                  | L      | 12      |
| LNU816                                                                                 | 78958.7  | 96.1                             | 0.02   | 47      | 12.0                            | 0.02   | 47      | 6.27                  | 0.01   | 26      |
| LNU809                                                                                 | 79168.3  | 77.9                             | 0.14   | 19      | 9.74                            | 0.14   | 19      | 5.46                  | 0.18   | 9       |
| LNU809                                                                                 | 79169.2  | 78.2                             | 0.17   | 20      | 9.77                            | 0.17   | 20      | 5.32                  | 0.21   | 7       |
| LNU783                                                                                 | 79176.3  | 74.1                             | 0.14   | 13      | 9.26                            | 0.14   | 13      | —                     | —      | —       |
| LNU783                                                                                 | 79176.6  | 77.0                             | 0.03   | 18      | 9.62                            | 0.03   | 18      | 5.44                  | 0.08   | 9       |
| LNU783                                                                                 | 79178.4  | 70.3                             | 0.27   | 7       | 8.79                            | 0.27   | 7       | 5.54                  | L      | 11      |
| LNU782                                                                                 | 77441.1  | 84.1                             | L      | 29      | 10.5                            | L      | 29      | 5.45                  | L      | 9       |
| LNU782                                                                                 | 77444.10 | 73.5                             | 0.15   | 12      | 9.19                            | 0.15   | 12      | 5.17                  | 0.23   | 4       |
| LNU782                                                                                 | 77444.9  | 91.8                             | 0.07   | 40      | 11.5                            | 0.07   | 40      | 6.19                  | 0.03   | 24      |
| LNU772                                                                                 | 78937.4  | —                                | —      | —       | —                               | —      | —       | 5.22                  | 0.26   | 5       |
| LNU772                                                                                 | 78938.1  | 96.4                             | L      | 47      | 12.1                            | L      | 47      | 6.07                  | L      | 22      |
| LNU772                                                                                 | 78938.2  | 73.9                             | 0.12   | 13      | 9.23                            | 0.12   | 13      | 5.29                  | 0.02   | 6       |
| LNU772                                                                                 | 78940.2  | 78.9                             | 0.04   | 21      | 9.87                            | 0.04   | 21      | 5.43                  | 0.12   | 9       |
| LNU762                                                                                 | 79329.2  | 80.9                             | L      | 24      | 10.1                            | L      | 24      | 5.50                  | L      | 10      |
| LNU757                                                                                 | 77481.1  | —                                | —      | —       | —                               | —      | —       | 5.12                  | 0.23   | 3       |
| LNU757                                                                                 | 77483.3  | 74.8                             | 0.05   | 14      | 9.34                            | 0.05   | 14      | 5.40                  | L      | 8       |
| CONT.                                                                                  | —        | 65.4                             | —      | —       | 8.18                            | —      | —       | 4.99                  | —      | —       |

TABLE 124-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |         |                                  |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------|---------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                              | Event # | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                        |         | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU907                                                                                 | 78872.1 | —                                | —      | —       | —                               | —      | —       | 5.68                  | 0.11   | 9       |
| LNU907                                                                                 | 78872.3 | —                                | —      | —       | —                               | —      | —       | 5.32                  | 0.21   | 2       |
| LNU882                                                                                 | 78973.1 | 78.8                             | L      | 10      | 9.85                            | L      | 10      | 5.48                  | L      | 5       |
| LNU882                                                                                 | 78973.4 | 85.5                             | 0.23   | 20      | 10.7                            | 0.23   | 20      | 5.74                  | 0.17   | 10      |
| LNU871                                                                                 | 78195.4 | 77.2                             | L      | 8       | 9.66                            | L      | 8       | 5.37                  | 0.07   | 3       |
| LNU865                                                                                 | 79761.7 | 80.8                             | L      | 13      | 10.1                            | L      | 13      | 5.49                  | 0.14   | 5       |
| LNU847                                                                                 | 78968.3 | —                                | —      | —       | —                               | —      | —       | 5.41                  | 0.07   | 4       |
| LNU845                                                                                 | 78917.3 | 75.2                             | 0.29   | 5       | 9.40                            | 0.29   | 5       | 5.34                  | 0.11   | 2       |
| LNU835                                                                                 | 78186.2 | 76.3                             | 0.10   | 7       | 9.54                            | 0.10   | 7       | —                     | —      | —       |
| LNU835                                                                                 | 78189.1 | 73.5                             | 0.26   | 3       | 9.19                            | 0.26   | 3       | 5.34                  | 0.27   | 2       |
| LNU807                                                                                 | 79250.1 | 81.1                             | 0.15   | 13      | 10.1                            | 0.15   | 13      | 5.50                  | L      | 6       |
| LNU766                                                                                 | 78931.1 | —                                | —      | —       | —                               | —      | —       | 5.31                  | 0.28   | 2       |
| LNU766                                                                                 | 78931.2 | —                                | —      | —       | —                               | —      | —       | 5.49                  | 0.26   | 5       |
| LNU766                                                                                 | 78932.1 | 88.4                             | 0.16   | 24      | 11.1                            | 0.16   | 24      | 5.78                  | 0.16   | 11      |
| CONT.                                                                                  | —       | 71.6                             | —      | —       | 8.94                            | —      | —       | 5.21                  | —      | —       |
| LNU975                                                                                 | 80622.1 | 62.2                             | 0.11   | 26      | 7.78                            | 0.11   | 26      | 4.99                  | 0.19   | 11      |
| LNU975                                                                                 | 80624.5 | 56.3                             | L      | 14      | 7.04                            | L      | 14      | 4.62                  | 0.14   | 3       |
| LNU971                                                                                 | 78395.1 | 57.1                             | L      | 15      | 7.14                            | L      | 15      | 4.82                  | L      | 7       |
| LNU971                                                                                 | 78395.2 | 60.4                             | L      | 22      | 7.55                            | L      | 22      | 5.02                  | L      | 12      |
| LNU964                                                                                 | 80548.6 | —                                | —      | —       | —                               | —      | —       | 4.58                  | 0.26   | 2       |
| LNU960                                                                                 | 78600.3 | 60.4                             | 0.06   | 22      | 7.55                            | 0.06   | 22      | 4.91                  | 0.03   | 9       |
| LNU957                                                                                 | 80437.8 | 52.0                             | 0.13   | 5       | 6.50                            | 0.13   | 5       | 4.70                  | 0.07   | 5       |
| LNU955                                                                                 | 80432.4 | 53.8                             | 0.07   | 9       | 6.72                            | 0.07   | 9       | 4.58                  | 0.28   | 2       |
| LNU953                                                                                 | 80427.1 | —                                | —      | —       | —                               | —      | —       | 4.76                  | 0.29   | 6       |
| LNU949                                                                                 | 80553.7 | 55.9                             | L      | 13      | 6.99                            | L      | 13      | 4.64                  | 0.15   | 3       |
| LNU949                                                                                 | 80553.8 | 55.1                             | 0.09   | 11      | 6.89                            | 0.09   | 11      | 4.74                  | 0.02   | 5       |
| LNU949                                                                                 | 80557.4 | —                                | —      | —       | —                               | —      | —       | 4.94                  | 0.21   | 10      |
| LNU946                                                                                 | 80648.2 | 52.2                             | 0.24   | 5       | 6.52                            | 0.24   | 5       | —                     | —      | —       |
| LNU944                                                                                 | 79781.6 | 53.2                             | 0.03   | 8       | 6.65                            | 0.03   | 8       | 4.68                  | 0.02   | 4       |
| LNU928                                                                                 | 78213.1 | 53.7                             | 0.28   | 9       | 6.71                            | 0.28   | 9       | 4.67                  | 0.05   | 4       |
| LNU917                                                                                 | 77500.4 | —                                | —      | —       | —                               | —      | —       | 4.79                  | 0.27   | 7       |
| LNU917                                                                                 | 77500.6 | —                                | —      | —       | —                               | —      | —       | 4.82                  | 0.06   | 7       |
| LNU906                                                                                 | 79219.1 | —                                | —      | —       | —                               | —      | —       | 4.61                  | 0.15   | 3       |
| LNU906                                                                                 | 79219.6 | —                                | —      | —       | —                               | —      | —       | 4.69                  | 0.08   | 4       |
| LNU904                                                                                 | 78987.3 | —                                | —      | —       | —                               | —      | —       | 4.68                  | 0.19   | 4       |
| LNU901                                                                                 | 80474.1 | 57.2                             | L      | 16      | 7.15                            | L      | 16      | 4.77                  | L      | 6       |
| LNU901                                                                                 | 80474.5 | 53.2                             | 0.04   | 8       | 6.65                            | 0.04   | 8       | 4.66                  | 0.04   | 4       |
| LNU901                                                                                 | 80476.5 | 59.5                             | 0.16   | 20      | 7.44                            | 0.16   | 20      | 4.81                  | 0.17   | 7       |
| LNU899                                                                                 | 79765.4 | —                                | —      | —       | —                               | —      | —       | 4.75                  | 0.13   | 6       |
| LNU899                                                                                 | 79766.2 | 52.3                             | 0.17   | 6       | 6.54                            | 0.17   | 6       | —                     | —      | —       |
| LNU899                                                                                 | 79766.3 | 55.1                             | 0.02   | 11      | 6.89                            | 0.02   | 11      | —                     | —      | —       |
| LNU897                                                                                 | 80445.2 | 69.1                             | L      | 40      | 8.63                            | L      | 40      | 5.15                  | L      | 15      |
| LNU892                                                                                 | 80410.1 | 54.1                             | 0.17   | 9       | 6.77                            | 0.17   | 9       | —                     | —      | —       |
| LNU892                                                                                 | 80414.5 | 53.5                             | 0.02   | 8       | 6.68                            | 0.02   | 8       | 4.63                  | 0.09   | 3       |
| LNU884                                                                                 | 80405.3 | 58.0                             | L      | 17      | 7.25                            | L      | 17      | 4.74                  | L      | 6       |
| LNU874                                                                                 | 78366.3 | 61.6                             | L      | 24      | 7.70                            | L      | 24      | 5.05                  | L      | 12      |
| LNU874                                                                                 | 78370.1 | 56.4                             | L      | 14      | 7.05                            | L      | 14      | 4.80                  | 0.25   | 7       |
| LNU874                                                                                 | 78370.3 | 56.6                             | L      | 14      | 7.08                            | L      | 14      | 4.82                  | L      | 7       |
| LNU873                                                                                 | 80469.3 | 53.2                             | 0.28   | 8       | 6.65                            | 0.28   | 8       | —                     | —      | —       |
| LNU873                                                                                 | 80473.3 | 55.1                             | 0.09   | 11      | 6.88                            | 0.09   | 11      | 4.62                  | 0.14   | 3       |
| LNU873                                                                                 | 80473.6 | 54.4                             | 0.10   | 10      | 6.79                            | 0.10   | 10      | 4.68                  | 0.24   | 4       |
| LNU870                                                                                 | 78501.1 | —                                | —      | —       | —                               | —      | —       | 4.70                  | 0.03   | 5       |
| LNU870                                                                                 | 78505.5 | 53.7                             | 0.15   | 9       | 6.72                            | 0.15   | 9       | 4.64                  | 0.12   | 3       |
| LNU867                                                                                 | 79590.4 | 61.1                             | 0.13   | 23      | 7.63                            | 0.13   | 23      | 4.89                  | L      | 9       |
| LNU867                                                                                 | 79590.7 | 58.6                             | L      | 18      | 7.32                            | L      | 18      | 4.93                  | 0.13   | 10      |
| LNU866                                                                                 | 80443.2 | 52.9                             | 0.04   | 7       | 6.62                            | 0.04   | 7       | —                     | —      | —       |
| LNU862                                                                                 | 79755.6 | —                                | —      | —       | —                               | —      | —       | 4.69                  | 0.28   | 4       |
| LNU862                                                                                 | 79757.1 | 54.9                             | 0.16   | 11      | 6.87                            | 0.16   | 11      | 4.82                  | 0.27   | 7       |
| LNU862                                                                                 | 79758.3 | —                                | —      | —       | —                               | —      | —       | 4.69                  | 0.09   | 4       |
| LNU862                                                                                 | 79758.5 | 70.4                             | L      | 42      | 8.80                            | L      | 42      | 5.41                  | L      | 20      |
| LNU856                                                                                 | 79753.3 | 55.3                             | L      | 12      | 6.91                            | L      | 12      | 4.79                  | L      | 7       |
| LNU831                                                                                 | 79331.7 | 67.1                             | 0.08   | 35      | 8.38                            | 0.08   | 35      | 5.18                  | L      | 15      |
| LNU829                                                                                 | 77912.3 | 58.6                             | 0.23   | 18      | 7.33                            | 0.23   | 18      | 4.98                  | 0.22   | 11      |
| LNU829                                                                                 | 77914.2 | 55.7                             | 0.25   | 13      | 6.96                            | 0.25   | 13      | 4.78                  | L      | 6       |
| LNU817                                                                                 | 80599.2 | 53.0                             | 0.03   | 7       | 6.62                            | 0.03   | 7       | —                     | —      | —       |
| LNU800                                                                                 | 77896.1 | 59.7                             | L      | 21      | 7.46                            | L      | 21      | 4.84                  | 0.06   | 8       |
| LNU800                                                                                 | 77896.4 | 53.7                             | 0.05   | 8       | 6.71                            | 0.05   | 8       | 4.76                  | 0.16   | 6       |
| LNU799                                                                                 | 78672.7 | 57.7                             | 0.03   | 17      | 7.21                            | 0.03   | 17      | 4.84                  | 0.11   | 8       |
| LNU799                                                                                 | 78674.5 | 60.7                             | 0.08   | 23      | 7.59                            | 0.08   | 23      | 4.94                  | 0.13   | 10      |
| LNU794                                                                                 | 78522.1 | 61.8                             | 0.18   | 25      | 7.73                            | 0.18   | 25      | 4.81                  | 0.15   | 7       |
| LNU794                                                                                 | 78524.1 | —                                | —      | —       | —                               | —      | —       | 4.95                  | 0.30   | 10      |

TABLE 124-continued

| Genes showing improved plant biomass production at limiting nitrogen growth conditions |          |                                  |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------|----------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                              | Event #  | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                        |          | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU794                                                                                 | 78524.5  | 58.6                             | 0.24   | 18      | 7.33                            | 0.24   | 18      | 4.93                  | 0.20   | 10      |
| LNU794                                                                                 | 78525.2  | 56.8                             | L      | 15      | 7.10                            | L      | 15      | 4.72                  | L      | 5       |
| LNU792                                                                                 | 79161.2  | 51.6                             | 0.28   | 4       | 6.45                            | 0.28   | 4       | —                     | —      | —       |
| LNU778                                                                                 | 78944.5  | 63.7                             | L      | 29      | 7.96                            | L      | 29      | 5.16                  | L      | 15      |
| LNU773                                                                                 | 80399.1  | 57.2                             | 0.01   | 16      | 7.16                            | 0.01   | 16      | 4.79                  | 0.23   | 7       |
| LNU763                                                                                 | 77588.6  | 64.2                             | L      | 30      | 8.02                            | L      | 30      | 4.83                  | 0.05   | 8       |
| LNU758                                                                                 | 79739.10 | 63.0                             | 0.15   | 27      | 7.88                            | 0.15   | 27      | —                     | —      | —       |
| LNU753                                                                                 | 77141.2  | 56.3                             | L      | 14      | 7.03                            | L      | 14      | 4.77                  | L      | 6       |
| LNU753                                                                                 | 77143.3  | 57.6                             | 0.02   | 16      | 7.19                            | 0.02   | 16      | 4.79                  | 0.07   | 7       |
| LNU753                                                                                 | 77144.1  | 56.0                             | L      | 13      | 7.00                            | L      | 13      | 4.80                  | L      | 7       |
| LNU749                                                                                 | 80792.2  | —                                | —      | —       | —                               | —      | —       | 4.76                  | 0.17   | 6       |
| LNU749                                                                                 | 80792.3  | 54.1                             | 0.09   | 9       | 6.76                            | 0.09   | 9       | 4.66                  | 0.07   | 4       |
| CONT.                                                                                  | —        | 49.5                             | —      | —       | 6.19                            | —      | —       | 4.49                  | —      | —       |
| LNU970                                                                                 | 78390.3  | 101.4                            | 0.22   | 8       | 12.7                            | 0.22   | 8       | —                     | —      | —       |
| LNU893                                                                                 | 77154.4  | 105.3                            | 0.09   | 12      | 13.2                            | 0.09   | 12      | 5.96                  | 0.18   | 6       |
| LNU885                                                                                 | 78416.5  | —                                | —      | —       | —                               | —      | —       | 6.04                  | 0.24   | 7       |
| LNU790                                                                                 | 78890.1  | 121.6                            | L      | 29      | 15.2                            | L      | 29      | 6.42                  | 0.01   | 14      |
| CONT.                                                                                  | —        | 94.1                             | —      | —       | 11.8                            | —      | —       | 5.64                  | —      | —       |
| LNU947                                                                                 | 77448.4  | 104.8                            | L      | 33      | 13.1                            | L      | 31      | 5.95                  | L      | 12      |
| LNU940                                                                                 | 77811.6  | 90.4                             | 0.27   | 15      | —                               | —      | —       | —                     | —      | —       |
| LNU940                                                                                 | 77813.1  | 96.4                             | 0.01   | 23      | 12.0                            | L      | 21      | 5.73                  | 0.03   | 8       |
| LNU900                                                                                 | 78851.3  | 94.7                             | 0.07   | 20      | 11.8                            | 0.09   | 19      | 5.60                  | 0.10   | 6       |
| LNU898                                                                                 | 78983.4  | 96.3                             | 0.10   | 23      | 12.0                            | 0.13   | 21      | 5.81                  | 0.05   | 10      |
| LNU894                                                                                 | 78283.4  | 85.5                             | 0.25   | 9       | 10.7                            | 0.28   | 7       | 5.49                  | 0.25   | 4       |
| LNU894                                                                                 | 78283.7  | 102.3                            | L      | 30      | 12.8                            | L      | 28      | 5.96                  | L      | 13      |
| LNU846                                                                                 | 78436.2  | 87.5                             | 0.26   | 11      | 10.9                            | 0.30   | 10      | —                     | —      | —       |
| LNU846                                                                                 | 78439.4  | 103.6                            | 0.07   | 32      | 13.0                            | 0.09   | 30      | 6.04                  | 0.08   | 14      |
| LNU820                                                                                 | 77807.2  | 89.2                             | 0.22   | 14      | 11.2                            | 0.26   | 12      | —                     | —      | —       |
| LNU820                                                                                 | 77809.1  | 86.5                             | 0.15   | 10      | 10.8                            | 0.15   | 8       | —                     | —      | —       |
| LNU815                                                                                 | 77492.6  | 85.2                             | 0.22   | 8       | 10.7                            | 0.23   | 7       | —                     | —      | —       |
| LNU815                                                                                 | 77494.1  | 103.8                            | 0.02   | 32      | 13.0                            | 0.03   | 30      | 5.94                  | L      | 12      |
| LNU814                                                                                 | 78953.2  | 84.6                             | 0.25   | 8       | 10.6                            | 0.27   | 6       | —                     | —      | —       |
| LNU811                                                                                 | 78176.8  | 86.8                             | 0.22   | 10      | 10.9                            | 0.24   | 9       | —                     | —      | —       |
| LNU811                                                                                 | 78179.1  | 97.6                             | 0.22   | 24      | 12.2                            | 0.25   | 22      | 5.78                  | 0.25   | 9       |
| LNU811                                                                                 | 78180.3  | 85.4                             | 0.21   | 9       | 10.7                            | 0.22   | 7       | —                     | —      | —       |
| LNU797                                                                                 | 78025.3  | —                                | —      | —       | —                               | —      | —       | 5.59                  | 0.16   | 6       |
| LNU793                                                                                 | 78168.1  | 87.7                             | 0.11   | 11      | 11.0                            | 0.10   | 10      | —                     | —      | —       |
| LNU793                                                                                 | 78169.1  | 85.3                             | 0.21   | 8       | 10.7                            | 0.21   | 7       | —                     | —      | —       |
| LNU769                                                                                 | 78163.4  | 85.6                             | 0.23   | 9       | 10.7                            | 0.25   | 7       | —                     | —      | —       |
| LNU756                                                                                 | 77581.3  | 90.6                             | 0.06   | 15      | 11.3                            | 0.05   | 14      | 5.51                  | 0.18   | 4       |
| LNU751                                                                                 | 77478.3  | 90.0                             | 0.10   | 14      | 11.3                            | 0.12   | 13      | —                     | —      | —       |
| CONT.                                                                                  | —        | 78.6                             | —      | —       | 9.97                            | —      | —       | 5.30                  | —      | —       |
| LNU965                                                                                 | 78360.5  | 112.4                            | 0.02   | 20      | 14.0                            | 0.06   | 18      | —                     | —      | —       |
| LNU943                                                                                 | 78407.2  | 110.0                            | 0.10   | 17      | 13.8                            | 0.15   | 15      | —                     | —      | —       |
| LNU913                                                                                 | 78593.1  | 115.2                            | 0.01   | 23      | 14.4                            | 0.04   | 21      | 6.19                  | 0.07   | 8       |
| LNU833                                                                                 | 78184.1  | 101.4                            | 0.07   | 8       | 12.7                            | 0.09   | 6       | 5.85                  | 0.14   | 2       |
| LNU764                                                                                 | 78926.1  | 103.8                            | 0.01   | 11      | 13.0                            | L      | 9       | 5.97                  | 0.18   | 4       |
| CONT.                                                                                  | —        | 93.7                             | —      | —       | 11.9                            | —      | —       | 5.75                  | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

The genes listed in Table 125 improved plant NUE when grown at limiting nitrogen concentration levels. These genes produced faster developing plants when grown under limiting nitrogen growth conditions, compared to control

plants, grown under identical conditions as measured by growth rate of leaf number, rosette diameter and plot coverage.

TABLE 125

| Genes showing improved rosette growth performance at limiting nitrogen growth conditions |         |                    |        |         |                                             |        |         |                                  |        |         |
|------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                          |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU952                                                                                   | 78218.1 | —                  | —      | —       | 5.74                                        | 0.18   | 17      | 0.354                            | 0.12   | 13      |
| LNU952                                                                                   | 78219.3 | —                  | —      | —       | —                                           | —      | —       | 0.345                            | 0.23   | 10      |
| LNU945                                                                                   | 78998.2 | —                  | —      | —       | —                                           | —      | —       | 0.347                            | 0.20   | 10      |
| LNU920                                                                                   | 78507.1 | —                  | —      | —       | 6.13                                        | 0.06   | 25      | 0.377                            | 0.03   | 20      |
| LNU920                                                                                   | 78508.1 | —                  | —      | —       | 5.90                                        | 0.10   | 20      | —                                | —      | —       |
| LNU920                                                                                   | 78508.2 | —                  | —      | —       | 6.12                                        | 0.05   | 25      | 0.372                            | 0.02   | 18      |
| LNU916                                                                                   | 78208.3 | —                  | —      | —       | 5.84                                        | 0.15   | 19      | 0.349                            | 0.19   | 11      |
| LNU914                                                                                   | 80516.2 | —                  | —      | —       | 5.79                                        | 0.15   | 18      | 0.356                            | 0.09   | 13      |
| LNU914                                                                                   | 80516.4 | —                  | —      | —       | —                                           | —      | —       | 0.344                            | 0.24   | 10      |
| LNU911                                                                                   | 80424.2 | —                  | —      | —       | —                                           | —      | —       | 0.349                            | 0.16   | 11      |
| LNU905                                                                                   | 79674.3 | —                  | —      | —       | 5.56                                        | 0.28   | 13      | 0.349                            | 0.21   | 11      |
| LNU905                                                                                   | 79675.3 | —                  | —      | —       | 6.01                                        | 0.08   | 23      | 0.369                            | 0.03   | 17      |
| LNU840                                                                                   | 78676.1 | —                  | —      | —       | 5.78                                        | 0.15   | 18      | 0.368                            | 0.04   | 17      |
| LNU840                                                                                   | 78676.4 | —                  | —      | —       | 6.08                                        | 0.06   | 24      | 0.346                            | 0.21   | 10      |
| LNU834_H1                                                                                | 80402.7 | —                  | —      | —       | 5.61                                        | 0.26   | 14      | 0.348                            | 0.20   | 11      |
| LNU832_H2                                                                                | 80605.1 | —                  | —      | —       | —                                           | —      | —       | 0.348                            | 0.22   | 11      |
| LNU819                                                                                   | 78133.3 | —                  | —      | —       | —                                           | —      | —       | 0.342                            | 0.26   | 9       |
| LNU791                                                                                   | 77893.1 | —                  | —      | —       | 6.26                                        | 0.04   | 28      | 0.381                            | 0.01   | 21      |
| LNU791                                                                                   | 77893.2 | —                  | —      | —       | 5.77                                        | 0.16   | 18      | 0.357                            | 0.09   | 14      |
| LNU760_H1                                                                                | 80127.2 | —                  | —      | —       | 6.04                                        | 0.08   | 23      | 0.358                            | 0.09   | 14      |
| CONT.                                                                                    | —       | —                  | —      | —       | 4.90                                        | —      | —       | 0.314                            | —      | —       |
| LNU966                                                                                   | 78604.1 | 0.819              | 0.23   | 12      | 9.03                                        | 0.03   | 29      | —                                | —      | —       |
| LNU966                                                                                   | 78605.5 | 0.839              | 0.15   | 15      | 9.63                                        | L      | 38      | 0.374                            | 0.25   | 11      |
| LNU966                                                                                   | 78605.7 | —                  | —      | —       | 8.64                                        | 0.04   | 24      | 0.375                            | 0.23   | 11      |
| LNU941                                                                                   | 78611.1 | 0.833              | 0.13   | 14      | 8.08                                        | 0.16   | 16      | —                                | —      | —       |
| LNU941                                                                                   | 78613.1 | —                  | —      | —       | 8.95                                        | 0.02   | 28      | 0.381                            | 0.17   | 13      |
| LNU941                                                                                   | 78613.5 | —                  | —      | —       | 8.12                                        | 0.22   | 16      | —                                | —      | —       |
| LNU941                                                                                   | 78615.3 | 0.812              | 0.28   | 11      | 8.86                                        | 0.02   | 27      | 0.376                            | 0.22   | 11      |
| LNU925                                                                                   | 78992.1 | —                  | —      | —       | 9.16                                        | 0.02   | 31      | 0.385                            | 0.16   | 14      |
| LNU925                                                                                   | 78992.6 | —                  | —      | —       | —                                           | —      | —       | 0.371                            | 0.29   | 10      |
| LNU922                                                                                   | 78290.1 | 0.833              | 0.18   | 14      | 8.73                                        | 0.05   | 25      | —                                | —      | —       |
| LNU918                                                                                   | 78433.1 | 0.805              | 0.22   | 10      | —                                           | —      | —       | —                                | —      | —       |
| LNU918                                                                                   | 78433.2 | —                  | —      | —       | 8.28                                        | 0.13   | 18      | —                                | —      | —       |
| LNU918                                                                                   | 78433.3 | —                  | —      | —       | 8.35                                        | 0.08   | 20      | —                                | —      | —       |
| LNU918                                                                                   | 78433.8 | 0.841              | 0.08   | 15      | —                                           | —      | —       | —                                | —      | —       |
| LNU918                                                                                   | 78434.2 | —                  | —      | —       | 7.84                                        | 0.27   | 12      | 0.375                            | 0.22   | 11      |
| LNU915                                                                                   | 78426.1 | —                  | —      | —       | 8.47                                        | 0.07   | 21      | 0.375                            | 0.24   | 11      |
| LNU915                                                                                   | 78427.1 | —                  | —      | —       | 8.24                                        | 0.14   | 18      | —                                | —      | —       |
| LNU915                                                                                   | 78428.1 | 0.880              | 0.03   | 21      | 9.41                                        | L      | 35      | —                                | —      | —       |
| LNU915                                                                                   | 78428.2 | 0.812              | 0.20   | 11      | 7.87                                        | 0.26   | 13      | —                                | —      | —       |
| LNU909                                                                                   | 78424.3 | 0.832              | 0.12   | 14      | 8.23                                        | 0.13   | 18      | —                                | —      | —       |
| LNU909                                                                                   | 78425.4 | 0.802              | 0.26   | 10      | 8.36                                        | 0.11   | 20      | —                                | —      | —       |
| LNU909                                                                                   | 78425.5 | 0.858              | 0.09   | 18      | 9.77                                        | L      | 40      | 0.390                            | 0.15   | 16      |
| LNU909                                                                                   | 78425.7 | —                  | —      | —       | 8.12                                        | 0.16   | 16      | —                                | —      | —       |
| LNU890                                                                                   | 78202.1 | 0.871              | 0.05   | 19      | 8.89                                        | 0.02   | 27      | —                                | —      | —       |
| LNU854                                                                                   | 78238.1 | —                  | —      | —       | 8.07                                        | 0.18   | 16      | —                                | —      | —       |
| LNU854                                                                                   | 78240.1 | —                  | —      | —       | 8.49                                        | 0.10   | 22      | 0.383                            | 0.24   | 14      |
| LNU849                                                                                   | 78498.4 | —                  | —      | —       | 8.44                                        | 0.06   | 21      | —                                | —      | —       |
| LNU849                                                                                   | 78499.1 | —                  | —      | —       | 8.31                                        | 0.10   | 19      | —                                | —      | —       |
| LNU849                                                                                   | 78500.3 | —                  | —      | —       | 8.66                                        | 0.07   | 24      | 0.380                            | 0.24   | 13      |
| LNU830                                                                                   | 78741.3 | —                  | —      | —       | 8.18                                        | 0.15   | 17      | 0.378                            | 0.22   | 12      |
| LNU830                                                                                   | 78741.5 | 0.917              | 0.05   | 26      | 9.41                                        | L      | 35      | 0.379                            | 0.22   | 12      |
| LNU824                                                                                   | 77826.1 | 0.877              | 0.07   | 20      | 9.81                                        | L      | 40      | 0.403                            | 0.06   | 20      |
| LNU824                                                                                   | 77828.4 | —                  | —      | —       | 8.21                                        | 0.13   | 17      | —                                | —      | —       |
| LNU824                                                                                   | 77829.3 | —                  | —      | —       | 8.66                                        | 0.04   | 24      | —                                | —      | —       |
| LNU822                                                                                   | 78623.2 | —                  | —      | —       | 9.81                                        | L      | 40      | 0.398                            | 0.13   | 18      |
| LNU822                                                                                   | 78623.6 | 0.809              | 0.27   | 11      | 10.5                                        | L      | 50      | 0.418                            | 0.02   | 24      |
| LNU822                                                                                   | 78623.7 | 0.817              | 0.23   | 12      | 8.88                                        | 0.03   | 27      | 0.379                            | 0.20   | 13      |
| LNU822                                                                                   | 78625.2 | 0.828              | 0.28   | 13      | 9.05                                        | 0.03   | 29      | 0.381                            | 0.23   | 13      |
| LNU822                                                                                   | 78625.7 | —                  | —      | —       | 8.20                                        | 0.16   | 17      | —                                | —      | —       |
| LNU813                                                                                   | 77682.3 | —                  | —      | —       | 9.07                                        | 0.02   | 30      | 0.399                            | 0.07   | 18      |
| LNU806                                                                                   | 78514.2 | —                  | —      | —       | 10.4                                        | L      | 48      | 0.428                            | L      | 27      |
| LNU806                                                                                   | 78515.3 | —                  | —      | —       | 8.21                                        | 0.12   | 18      | —                                | —      | —       |
| LNU806                                                                                   | 78515.4 | 0.876              | 0.04   | 20      | 8.08                                        | 0.17   | 16      | —                                | —      | —       |
| LNU806                                                                                   | 78515.5 | 0.895              | 0.05   | 23      | 8.97                                        | 0.02   | 28      | —                                | —      | —       |

TABLE 125-continued

| Genes showing improved rosette growth performance at limiting nitrogen growth conditions |          |                    |        |         |                                             |        |         |                                  |        |         |
|------------------------------------------------------------------------------------------|----------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                | Event #  | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                          |          | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU802                                                                                   | 80307.3  | —                  | —      | —       | 7.86                                        | 0.26   | 13      | —                                | —      | —       |
| LNU802                                                                                   | 80309.2  | —                  | —      | —       | 7.87                                        | 0.28   | 13      | —                                | —      | —       |
| LNU802                                                                                   | 80309.3  | —                  | —      | —       | 8.00                                        | 0.21   | 15      | —                                | —      | —       |
| LNU802                                                                                   | 80310.1  | —                  | —      | —       | 8.08                                        | 0.17   | 16      | —                                | —      | —       |
| LNU779                                                                                   | 77887.2  | 0.822              | 0.18   | 13      | 9.09                                        | 0.01   | 30      | 0.377                            | 0.23   | 12      |
| LNU761                                                                                   | 78157.6  | 0.828              | 0.20   | 13      | 8.18                                        | 0.14   | 17      | —                                | —      | —       |
| LNU761                                                                                   | 78159.1  | —                  | —      | —       | 7.91                                        | 0.25   | 13      | —                                | —      | —       |
| LNU761                                                                                   | 78160.3  | 0.848              | 0.12   | 16      | 9.99                                        | L      | 43      | 0.410                            | 0.03   | 22      |
| CONT.                                                                                    | —        | 0.730              | —      | —       | 6.99                                        | —      | —       | 0.337                            | —      | —       |
| LNU976                                                                                   | 78364.1  | —                  | —      | —       | 5.53                                        | L      | 48      | 0.334                            | 0.01   | 27      |
| LNU970                                                                                   | 78388.1  | —                  | —      | —       | 4.43                                        | 0.15   | 18      | —                                | —      | —       |
| LNU970                                                                                   | 78389.8  | 0.669              | 0.27   | 14      | 5.28                                        | L      | 41      | 0.299                            | 0.20   | 13      |
| LNU968                                                                                   | 77919.4  | —                  | —      | —       | 4.44                                        | 0.15   | 19      | —                                | —      | —       |
| LNU963                                                                                   | 78383.4  | —                  | —      | —       | 4.46                                        | 0.14   | 19      | —                                | —      | —       |
| LNU962                                                                                   | 78635.8  | 0.666              | 0.27   | 13      | —                                           | —      | —       | —                                | —      | —       |
| LNU950                                                                                   | 78913.4  | —                  | —      | —       | 4.81                                        | 0.03   | 29      | 0.297                            | 0.24   | 13      |
| LNU950                                                                                   | 78915.2  | —                  | —      | —       | 4.35                                        | 0.20   | 16      | —                                | —      | —       |
| LNU949                                                                                   | 80553.5  | —                  | —      | —       | 4.56                                        | 0.11   | 22      | 0.299                            | 0.23   | 14      |
| LNU949                                                                                   | 80553.8  | —                  | —      | —       | 4.80                                        | 0.03   | 28      | —                                | —      | —       |
| LNU949                                                                                   | 80557.4  | —                  | —      | —       | 4.25                                        | 0.30   | 14      | —                                | —      | —       |
| LNU934                                                                                   | 79008.1  | —                  | —      | —       | —                                           | —      | —       | 0.297                            | 0.22   | 13      |
| LNU908                                                                                   | 79738.5  | 0.670              | 0.28   | 14      | —                                           | —      | —       | —                                | —      | —       |
| LNU902                                                                                   | 79606.5  | —                  | —      | —       | 4.51                                        | 0.12   | 21      | —                                | —      | —       |
| LNU875                                                                                   | 78413.4  | —                  | —      | —       | 4.40                                        | 0.19   | 18      | —                                | —      | —       |
| LNU873                                                                                   | 80473.4  | —                  | —      | —       | 4.40                                        | 0.20   | 18      | 0.300                            | 0.21   | 14      |
| LNU843                                                                                   | 78962.4  | —                  | —      | —       | 4.61                                        | 0.08   | 23      | —                                | —      | —       |
| LNU843                                                                                   | 78963.2  | —                  | —      | —       | 4.35                                        | 0.20   | 16      | —                                | —      | —       |
| LNU790                                                                                   | 78886.2  | 0.697              | 0.16   | 18      | 4.94                                        | 0.02   | 32      | —                                | —      | —       |
| LNU790                                                                                   | 78886.3  | 0.677              | 0.27   | 15      | 4.25                                        | 0.28   | 14      | 0.292                            | 0.30   | 11      |
| LNU790                                                                                   | 78889.2  | 0.686              | 0.21   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU787                                                                                   | 80547.7  | 0.721              | 0.09   | 22      | —                                           | —      | —       | —                                | —      | —       |
| LNU767                                                                                   | 79146.1  | 0.695              | 0.20   | 18      | 5.12                                        | L      | 37      | 0.302                            | 0.17   | 15      |
| LNU767                                                                                   | 79146.2  | —                  | —      | —       | 4.43                                        | 0.15   | 19      | 0.300                            | 0.18   | 14      |
| CONT.                                                                                    | —        | 0.589              | —      | —       | 3.74                                        | —      | —       | 0.263                            | —      | —       |
| LNU966                                                                                   | 78605.5  | 0.819              | 0.20   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU941                                                                                   | 78614.2  | —                  | —      | —       | 13.8                                        | 0.19   | 23      | —                                | —      | —       |
| LNU922                                                                                   | 78287.3  | 0.798              | 0.26   | 14      | —                                           | —      | —       | —                                | —      | —       |
| LNU915                                                                                   | 78428.2  | 0.807              | 0.26   | 15      | —                                           | —      | —       | —                                | —      | —       |
| LNU854                                                                                   | 78237.2  | —                  | —      | —       | 14.2                                        | 0.14   | 27      | —                                | —      | —       |
| LNU830                                                                                   | 78741.5  | —                  | —      | —       | 13.3                                        | 0.28   | 19      | —                                | —      | —       |
| LNU813                                                                                   | 77685.1  | —                  | —      | —       | 13.6                                        | 0.21   | 22      | —                                | —      | —       |
| LNU751                                                                                   | 77477.1  | 0.878              | 0.07   | 25      | —                                           | —      | —       | —                                | —      | —       |
| CONT.                                                                                    | —        | 0.702              | —      | —       | 11.2                                        | —      | —       | —                                | —      | —       |
| LNU948                                                                                   | 78378.1  | —                  | —      | —       | 10.5                                        | 0.04   | 22      | —                                | —      | —       |
| LNU888                                                                                   | 78771.1  | —                  | —      | —       | 10.7                                        | 0.05   | 25      | 0.481                            | 0.05   | 24      |
| LNU881                                                                                   | 78372.2  | —                  | —      | —       | 9.74                                        | 0.19   | 13      | —                                | —      | —       |
| LNU857                                                                                   | 78867.2  | —                  | —      | —       | 9.70                                        | 0.23   | 13      | —                                | —      | —       |
| LNU816                                                                                   | 78958.5  | —                  | —      | —       | 10.9                                        | 0.02   | 26      | 0.481                            | 0.02   | 24      |
| LNU816                                                                                   | 78958.7  | —                  | —      | —       | 10.4                                        | 0.05   | 21      | 0.449                            | 0.10   | 16      |
| LNU809                                                                                   | 79168.2  | —                  | —      | —       | 10.1                                        | 0.15   | 17      | —                                | —      | —       |
| LNU809                                                                                   | 79168.3  | —                  | —      | —       | 9.60                                        | 0.28   | 11      | 0.430                            | 0.26   | 11      |
| LNU807                                                                                   | 79248.1  | —                  | —      | —       | —                                           | —      | —       | 0.430                            | 0.24   | 11      |
| LNU795                                                                                   | 79525.1  | —                  | —      | —       | 9.66                                        | 0.24   | 12      | —                                | —      | —       |
| LNU795                                                                                   | 79525.5  | —                  | —      | —       | —                                           | —      | —       | 0.429                            | 0.23   | 11      |
| LNU788                                                                                   | 78516.1  | —                  | —      | —       | 10.8                                        | 0.02   | 25      | 0.454                            | 0.14   | 17      |
| LNU788                                                                                   | 78518.1  | —                  | —      | —       | 12.2                                        | L      | 41      | 0.466                            | 0.04   | 20      |
| LNU783                                                                                   | 79178.2  | —                  | —      | —       | —                                           | —      | —       | 0.446                            | 0.19   | 15      |
| LNU778                                                                                   | 78941.1  | —                  | —      | —       | 10.0                                        | 0.15   | 16      | —                                | —      | —       |
| LNU778                                                                                   | 78944.2  | —                  | —      | —       | 9.86                                        | 0.16   | 14      | 0.432                            | 0.22   | 12      |
| LNU752                                                                                   | 78153.10 | —                  | —      | —       | 11.1                                        | 0.03   | 29      | 0.503                            | 0.01   | 30      |
| CONT.                                                                                    | —        | —                  | —      | —       | 8.61                                        | —      | —       | 0.388                            | —      | —       |
| LNU933                                                                                   | 78897.1  | 0.890              | 0.12   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU882                                                                                   | 78975.3  | 0.863              | 0.23   | 13      | —                                           | —      | —       | —                                | —      | —       |
| LNU880                                                                                   | 78196.1  | —                  | —      | —       | —                                           | —      | —       | 0.490                            | 0.30   | 9       |
| LNU880                                                                                   | 78200.6  | —                  | —      | —       | 12.0                                        | 0.15   | 21      | 0.502                            | 0.18   | 11      |
| LNU848                                                                                   | 77906.2  | —                  | —      | —       | 11.6                                        | 0.24   | 17      | —                                | —      | —       |
| LNU848                                                                                   | 77907.4  | 0.866              | 0.18   | 14      | —                                           | —      | —       | —                                | —      | —       |
| LNU847                                                                                   | 78967.2  | 0.892              | 0.13   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU847                                                                                   | 78967.4  | 0.858              | 0.23   | 13      | —                                           | —      | —       | —                                | —      | —       |
| LNU846                                                                                   | 78436.2  | 0.938              | 0.04   | 23      | —                                           | —      | —       | —                                | —      | —       |
| LNU846                                                                                   | 78438.2  | —                  | —      | —       | —                                           | —      | —       | 0.502                            | 0.16   | 11      |

TABLE 125-continued

| Genes showing improved rosette growth performance at limiting nitrogen growth conditions |          |                    |        |         |                                             |        |         |                                  |        |         |
|------------------------------------------------------------------------------------------|----------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                | Event #  | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                          |          | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU846                                                                                   | 78439.4  | 0.852              | 0.26   | 12      | 13.1                                        | 0.02   | 32      | 0.506                            | 0.13   | 12      |
| LNU828                                                                                   | 77598.3  | 0.876              | 0.16   | 15      | 12.0                                        | 0.14   | 21      | 0.512                            | 0.11   | 14      |
| LNU814                                                                                   | 78953.3  | 0.885              | 0.15   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU814                                                                                   | 78955.4  | 0.865              | 0.23   | 13      | —                                           | —      | —       | —                                | —      | —       |
| LNU772                                                                                   | 78937.4  | 0.849              | 0.29   | 11      | —                                           | —      | —       | —                                | —      | —       |
| LNU772                                                                                   | 78938.1  | —                  | —      | —       | 13.0                                        | 0.04   | 31      | 0.500                            | 0.21   | 11      |
| LNU772                                                                                   | 78940.2  | 0.861              | 0.26   | 13      | —                                           | —      | —       | —                                | —      | —       |
| LNU757                                                                                   | 77485.4  | —                  | —      | —       | 11.6                                        | 0.23   | 17      | —                                | —      | —       |
| LNU750                                                                                   | 78863.2  | —                  | —      | —       | —                                           | —      | —       | 0.493                            | 0.23   | 9       |
| CONT.                                                                                    | —        | 0.762              | —      | —       | 9.91                                        | —      | —       | 0.451                            | —      | —       |
| LNU972                                                                                   | 78907.1  | —                  | —      | —       | 9.59                                        | 0.11   | 22      | —                                | —      | —       |
| LNU972                                                                                   | 78908.2  | 0.810              | 0.24   | 14      | 9.30                                        | 0.17   | 18      | 0.443                            | 0.13   | 13      |
| LNU972                                                                                   | 78909.3  | 0.862              | 0.08   | 22      | 10.8                                        | 0.01   | 38      | 0.481                            | 0.02   | 23      |
| LNU961                                                                                   | 79143.3  | —                  | —      | —       | 9.64                                        | 0.10   | 23      | 0.455                            | 0.07   | 16      |
| LNU961                                                                                   | 79143.4  | —                  | —      | —       | —                                           | —      | —       | 0.438                            | 0.18   | 12      |
| LNU961                                                                                   | 79145.3  | 0.801              | 0.27   | 13      | 9.44                                        | 0.14   | 20      | 0.443                            | 0.13   | 13      |
| LNU961                                                                                   | 79145.6  | 0.806              | 0.26   | 14      | —                                           | —      | —       | —                                | —      | —       |
| LNU958                                                                                   | 77687.2  | 0.893              | 0.05   | 26      | 10.5                                        | 0.02   | 33      | 0.492                            | L      | 26      |
| LNU958                                                                                   | 77687.5  | —                  | —      | —       | 9.85                                        | 0.06   | 25      | 0.448                            | 0.10   | 14      |
| LNU958                                                                                   | 77689.1  | —                  | —      | —       | 10.2                                        | 0.03   | 30      | 0.479                            | 0.02   | 22      |
| LNU958                                                                                   | 77689.2  | —                  | —      | —       | 9.40                                        | 0.15   | 20      | 0.440                            | 0.17   | 12      |
| LNU948                                                                                   | 78378.1  | 0.810              | 0.26   | 14      | 10.0                                        | 0.04   | 28      | 0.472                            | 0.02   | 20      |
| LNU948                                                                                   | 78379.4  | —                  | —      | —       | 9.34                                        | 0.17   | 19      | 0.437                            | 0.20   | 12      |
| LNU948                                                                                   | 78380.2  | 0.836              | 0.14   | 18      | 10.1                                        | 0.04   | 29      | 0.443                            | 0.14   | 13      |
| LNU921                                                                                   | 79063.2  | 0.889              | 0.04   | 25      | 10.1                                        | 0.04   | 28      | 0.445                            | 0.12   | 14      |
| LNU921                                                                                   | 79064.3  | 0.806              | 0.28   | 14      | —                                           | —      | —       | 0.433                            | 0.23   | 11      |
| LNU913                                                                                   | 78592.1  | —                  | —      | —       | 9.58                                        | 0.11   | 22      | —                                | —      | —       |
| LNU913                                                                                   | 78592.3  | 0.798              | 0.29   | 13      | 9.17                                        | 0.22   | 17      | —                                | —      | —       |
| LNU913                                                                                   | 78592.4  | —                  | —      | —       | 10.4                                        | 0.02   | 32      | 0.454                            | 0.09   | 16      |
| LNU913                                                                                   | 78593.1  | 0.831              | 0.16   | 17      | 10.4                                        | 0.02   | 32      | 0.452                            | 0.08   | 16      |
| LNU913                                                                                   | 78593.6  | —                  | —      | —       | 11.1                                        | L      | 42      | 0.482                            | 0.01   | 23      |
| LNU912                                                                                   | 78401.3  | —                  | —      | —       | —                                           | —      | —       | 0.431                            | 0.28   | 10      |
| LNU912                                                                                   | 78403.2  | —                  | —      | —       | 10.1                                        | 0.04   | 28      | 0.462                            | 0.05   | 18      |
| LNU912                                                                                   | 78404.1  | 0.806              | 0.25   | 14      | 9.74                                        | 0.08   | 24      | 0.441                            | 0.16   | 13      |
| LNU889                                                                                   | 79601.4  | —                  | —      | —       | 9.11                                        | 0.23   | 16      | 0.433                            | 0.23   | 11      |
| LNU889                                                                                   | 79602.4  | 0.802              | 0.29   | 13      | 9.30                                        | 0.19   | 18      | —                                | —      | —       |
| LNU888                                                                                   | 78772.2  | 0.804              | 0.30   | 13      | —                                           | —      | —       | —                                | —      | —       |
| LNU881                                                                                   | 78372.2  | 0.833              | 0.15   | 18      | 10.9                                        | L      | 39      | 0.471                            | 0.02   | 20      |
| LNU881                                                                                   | 78373.1  | 0.846              | 0.12   | 19      | —                                           | —      | —       | —                                | —      | —       |
| LNU881                                                                                   | 78373.2  | 0.831              | 0.20   | 17      | 10.8                                        | 0.01   | 37      | 0.466                            | 0.04   | 19      |
| LNU823                                                                                   | 78136.4  | 0.856              | 0.10   | 21      | 10.5                                        | 0.02   | 34      | 0.466                            | 0.04   | 19      |
| LNU816                                                                                   | 78957.1  | —                  | —      | —       | 9.02                                        | 0.27   | 15      | —                                | —      | —       |
| LNU816                                                                                   | 78958.4  | —                  | —      | —       | 10.5                                        | 0.01   | 34      | 0.455                            | 0.07   | 16      |
| LNU816                                                                                   | 78958.7  | —                  | —      | —       | 11.3                                        | L      | 44      | 0.497                            | L      | 27      |
| LNU809                                                                                   | 79168.3  | —                  | —      | —       | 9.38                                        | 0.17   | 19      | 0.456                            | 0.07   | 16      |
| LNU809                                                                                   | 79169.2  | —                  | —      | —       | 9.42                                        | 0.15   | 20      | 0.444                            | 0.13   | 13      |
| LNU783                                                                                   | 79176.3  | —                  | —      | —       | 9.01                                        | 0.27   | 15      | —                                | —      | —       |
| LNU783                                                                                   | 79176.6  | —                  | —      | —       | 9.33                                        | 0.16   | 19      | 0.445                            | 0.13   | 14      |
| LNU783                                                                                   | 79178.4  | —                  | —      | —       | —                                           | —      | —       | 0.462                            | 0.04   | 18      |
| LNU782                                                                                   | 77441.1  | 0.884              | 0.07   | 25      | 10.1                                        | 0.04   | 29      | 0.428                            | 0.28   | 9       |
| LNU782                                                                                   | 77444.10 | 0.812              | 0.23   | 15      | —                                           | —      | —       | —                                | —      | —       |
| LNU782                                                                                   | 77444.2  | 0.798              | 0.29   | 13      | —                                           | —      | —       | —                                | —      | —       |
| LNU782                                                                                   | 77444.9  | —                  | —      | —       | 10.9                                        | L      | 39      | 0.509                            | L      | 30      |
| LNU772                                                                                   | 78938.1  | 0.945              | 0.02   | 33      | 11.7                                        | L      | 49      | 0.506                            | L      | 29      |
| LNU772                                                                                   | 78940.2  | —                  | —      | —       | 9.42                                        | 0.14   | 20      | —                                | —      | —       |
| LNU762                                                                                   | 79329.2  | —                  | —      | —       | 9.70                                        | 0.09   | 23      | 0.440                            | 0.15   | 12      |
| LNU757                                                                                   | 77481.1  | 0.857              | 0.09   | 21      | —                                           | —      | —       | —                                | —      | —       |
| LNU757                                                                                   | 77483.2  | 0.820              | 0.21   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU757                                                                                   | 77483.3  | 0.832              | 0.16   | 17      | —                                           | —      | —       | 0.447                            | 0.12   | 14      |
| CONT.                                                                                    | —        | 0.708              | —      | —       | 7.85                                        | —      | —       | 0.391                            | —      | —       |
| LNU882                                                                                   | 78973.4  | —                  | —      | —       | 10.2                                        | 0.09   | 18      | 0.449                            | 0.25   | 8       |
| LNU807                                                                                   | 79250.1  | —                  | —      | —       | 9.82                                        | 0.18   | 14      | —                                | —      | —       |
| LNU766                                                                                   | 78932.1  | —                  | —      | —       | 10.6                                        | 0.04   | 22      | —                                | —      | —       |
| CONT.                                                                                    | —        | —                  | —      | —       | 8.64                                        | —      | —       | 0.416                            | —      | —       |
| LNU975                                                                                   | 80622.1  | —                  | —      | —       | 7.90                                        | L      | 28      | 0.416                            | 0.05   | 16      |
| LNU975                                                                                   | 80624.5  | 0.743              | 0.20   | 19      | 7.02                                        | 0.14   | 14      | —                                | —      | —       |
| LNU971                                                                                   | 78395.1  | —                  | —      | —       | 7.01                                        | 0.16   | 14      | —                                | —      | —       |
| LNU971                                                                                   | 78395.2  | —                  | —      | —       | 7.28                                        | 0.06   | 18      | 0.400                            | 0.13   | 12      |
| LNU960                                                                                   | 78599.4  | 0.725              | 0.28   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU960                                                                                   | 78600.3  | —                  | —      | —       | 7.49                                        | 0.03   | 22      | 0.400                            | 0.13   | 12      |
| LNU957                                                                                   | 80435.3  | 0.723              | 0.30   | 16      | —                                           | —      | —       | —                                | —      | —       |

TABLE 125-continued

| Genes showing improved rosette growth performance at limiting nitrogen growth conditions |          |                    |        |         |                                             |        |         |                                  |        |         |
|------------------------------------------------------------------------------------------|----------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                | Event #  | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                          |          | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU955                                                                                   | 80432.3  | 0.735              | 0.24   | 18      | —                                           | —      | —       | —                                | —      | —       |
| LNU955                                                                                   | 80432.4  | —                  | —      | —       | 6.83                                        | 0.25   | 11      | —                                | —      | —       |
| LNU953                                                                                   | 80429.1  | 0.722              | 0.30   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU949                                                                                   | 80553.7  | —                  | —      | —       | 6.94                                        | 0.19   | 13      | —                                | —      | —       |
| LNU949                                                                                   | 80557.4  | —                  | —      | —       | 7.12                                        | 0.12   | 16      | 0.396                            | 0.19   | 11      |
| LNU928                                                                                   | 78212.1  | 0.818              | 0.04   | 31      | —                                           | —      | —       | —                                | —      | —       |
| LNU928                                                                                   | 78213.1  | —                  | —      | —       | 6.82                                        | 0.25   | 11      | —                                | —      | —       |
| LNU923                                                                                   | 77603.3  | —                  | —      | —       | —                                           | —      | —       | 0.391                            | 0.24   | 9       |
| LNU917                                                                                   | 77500.4  | —                  | —      | —       | 6.91                                        | 0.25   | 12      | —                                | —      | —       |
| LNU906                                                                                   | 79219.5  | 0.743              | 0.21   | 19      | —                                           | —      | —       | —                                | —      | —       |
| LNU904                                                                                   | 78987.2  | 0.775              | 0.11   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU901                                                                                   | 80476.5  | —                  | —      | —       | 7.41                                        | 0.04   | 20      | —                                | —      | —       |
| LNU899                                                                                   | 79765.4  | —                  | —      | —       | 6.88                                        | 0.22   | 12      | 0.395                            | 0.18   | 10      |
| LNU899                                                                                   | 79766.2  | —                  | —      | —       | —                                           | —      | —       | 0.390                            | 0.28   | 9       |
| LNU897                                                                                   | 80445.2  | —                  | —      | —       | 8.64                                        | L      | 40      | 0.431                            | 0.01   | 20      |
| LNU892                                                                                   | 80410.1  | —                  | —      | —       | —                                           | —      | —       | 0.393                            | 0.23   | 10      |
| LNU884                                                                                   | 80405.3  | —                  | —      | —       | 7.35                                        | 0.04   | 19      | —                                | —      | —       |
| LNU884                                                                                   | 80407.1  | —                  | —      | —       | 7.09                                        | 0.13   | 15      | —                                | —      | —       |
| LNU884                                                                                   | 80408.2  | —                  | —      | —       | 7.12                                        | 0.15   | 16      | —                                | —      | —       |
| LNU884                                                                                   | 80408.4  | —                  | —      | —       | 7.10                                        | 0.13   | 15      | 0.395                            | 0.21   | 10      |
| LNU874                                                                                   | 78366.3  | —                  | —      | —       | 7.47                                        | 0.03   | 21      | 0.402                            | 0.11   | 12      |
| LNU874                                                                                   | 78370.1  | —                  | —      | —       | 7.03                                        | 0.13   | 14      | —                                | —      | —       |
| LNU874                                                                                   | 78370.3  | —                  | —      | —       | 7.05                                        | 0.12   | 15      | 0.398                            | 0.15   | 11      |
| LNU874                                                                                   | 78370.7  | 0.727              | 0.28   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU873                                                                                   | 80469.1  | 0.771              | 0.12   | 24      | —                                           | —      | —       | —                                | —      | —       |
| LNU873                                                                                   | 80473.3  | —                  | —      | —       | 6.91                                        | 0.19   | 12      | —                                | —      | —       |
| LNU873                                                                                   | 80473.6  | —                  | —      | —       | 6.88                                        | 0.21   | 12      | 0.400                            | 0.13   | 12      |
| LNU870                                                                                   | 78501.1  | —                  | —      | —       | —                                           | —      | —       | 0.398                            | 0.15   | 11      |
| LNU870                                                                                   | 78505.1  | —                  | —      | —       | —                                           | —      | —       | 0.401                            | 0.14   | 12      |
| LNU867                                                                                   | 79589.3  | —                  | —      | —       | —                                           | —      | —       | 0.389                            | 0.27   | 9       |
| LNU867                                                                                   | 79590.3  | 0.746              | 0.22   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU867                                                                                   | 79590.4  | —                  | —      | —       | 7.30                                        | 0.07   | 18      | —                                | —      | —       |
| LNU867                                                                                   | 79590.7  | —                  | —      | —       | 7.30                                        | 0.05   | 19      | 0.405                            | 0.10   | 13      |
| LNU866                                                                                   | 80442.2  | 0.734              | 0.25   | 18      | —                                           | —      | —       | —                                | —      | —       |
| LNU866                                                                                   | 80443.2  | 0.752              | 0.17   | 21      | —                                           | —      | —       | —                                | —      | —       |
| LNU866                                                                                   | 80444.6  | —                  | —      | —       | 6.87                                        | 0.24   | 12      | —                                | —      | —       |
| LNU862                                                                                   | 79757.1  | —                  | —      | —       | —                                           | —      | —       | 0.391                            | 0.26   | 9       |
| LNU862                                                                                   | 79758.3  | —                  | —      | —       | —                                           | —      | —       | 0.392                            | 0.22   | 10      |
| LNU862                                                                                   | 79758.5  | —                  | —      | —       | 8.82                                        | L      | 43      | 0.459                            | L      | 28      |
| LNU856                                                                                   | 79753.3  | —                  | —      | —       | 6.80                                        | 0.26   | 10      | —                                | —      | —       |
| LNU856                                                                                   | 79753.5  | 0.742              | 0.21   | 19      | —                                           | —      | —       | —                                | —      | —       |
| LNU831                                                                                   | 79331.7  | —                  | —      | —       | 8.43                                        | L      | 37      | 0.428                            | 0.01   | 20      |
| LNU831                                                                                   | 79335.2  | 0.783              | 0.10   | 26      | —                                           | —      | —       | —                                | —      | —       |
| LNU829                                                                                   | 77912.3  | —                  | —      | —       | 7.24                                        | 0.07   | 18      | 0.399                            | 0.16   | 11      |
| LNU829                                                                                   | 77914.1  | 0.774              | 0.11   | 24      | —                                           | —      | —       | —                                | —      | —       |
| LNU829                                                                                   | 77914.2  | —                  | —      | —       | 6.90                                        | 0.21   | 12      | 0.398                            | 0.15   | 11      |
| LNU817                                                                                   | 80598.1  | —                  | —      | —       | 6.81                                        | 0.28   | 11      | —                                | —      | —       |
| LNU800                                                                                   | 77896.1  | —                  | —      | —       | 7.38                                        | 0.04   | 20      | —                                | —      | —       |
| LNU799                                                                                   | 78672.5  | 0.725              | 0.29   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU799                                                                                   | 78672.7  | —                  | —      | —       | 7.09                                        | 0.11   | 15      | —                                | —      | —       |
| LNU799                                                                                   | 78674.2  | —                  | —      | —       | 7.03                                        | 0.15   | 14      | —                                | —      | —       |
| LNU799                                                                                   | 78674.5  | —                  | —      | —       | 7.50                                        | 0.02   | 22      | 0.406                            | 0.10   | 13      |
| LNU796                                                                                   | 78235.5  | 0.755              | 0.16   | 21      | —                                           | —      | —       | —                                | —      | —       |
| LNU794                                                                                   | 78522.1  | —                  | —      | —       | 7.67                                        | 0.02   | 25      | —                                | —      | —       |
| LNU794                                                                                   | 78524.1  | —                  | —      | —       | 7.85                                        | 0.01   | 28      | 0.399                            | 0.18   | 11      |
| LNU794                                                                                   | 78524.5  | —                  | —      | —       | 7.30                                        | 0.06   | 19      | 0.392                            | 0.24   | 9       |
| LNU794                                                                                   | 78525.2  | —                  | —      | —       | 7.14                                        | 0.09   | 16      | —                                | —      | —       |
| LNU792                                                                                   | 79161.2  | 0.778              | 0.11   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU792                                                                                   | 79162.2  | 0.720              | 0.30   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU778                                                                                   | 78943.5  | 0.778              | 0.10   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU778                                                                                   | 78944.1  | 0.841              | 0.03   | 35      | —                                           | —      | —       | —                                | —      | —       |
| LNU778                                                                                   | 78944.5  | —                  | —      | —       | 8.11                                        | L      | 32      | 0.432                            | L      | 21      |
| LNU773                                                                                   | 80399.1  | —                  | —      | —       | 6.96                                        | 0.16   | 13      | —                                | —      | —       |
| LNU771                                                                                   | 80077.2  | —                  | —      | —       | 6.83                                        | 0.28   | 11      | 0.403                            | 0.12   | 13      |
| LNU763                                                                                   | 77588.6  | —                  | —      | —       | 7.62                                        | 0.02   | 24      | —                                | —      | —       |
| LNU763                                                                                   | 77589.3  | 0.725              | 0.28   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU758                                                                                   | 79739.10 | —                  | —      | —       | 7.84                                        | L      | 27      | 0.400                            | 0.17   | 12      |
| LNU753                                                                                   | 77141.2  | —                  | —      | —       | 6.90                                        | 0.20   | 12      | —                                | —      | —       |
| LNU753                                                                                   | 77143.3  | —                  | —      | —       | 7.23                                        | 0.06   | 17      | —                                | —      | —       |
| LNU753                                                                                   | 77144.1  | —                  | —      | —       | 6.88                                        | 0.21   | 12      | 0.387                            | 0.29   | 8       |
| CONT.                                                                                    | —        | 0.622              | —      | —       | 6.16                                        | —      | —       | 0.358                            | —      | —       |

TABLE 125-continued

| Genes showing improved rosette growth performance at limiting nitrogen growth conditions |         |                    |        |         |                                             |        |         |                                  |        |         |
|------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                          |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU790                                                                                   | 78890.1 | —                  | —      | —       | 14.8                                        | 0.04   | 29      | 0.510                            | 0.25   | 13      |
| CONT.                                                                                    | —       | —                  | —      | —       | 11.5                                        | —      | —       | 0.452                            | —      | —       |
| LNU947                                                                                   | 77448.4 | —                  | —      | —       | 12.6                                        | 0.02   | 32      | —                                | —      | —       |
| LNU940                                                                                   | 77813.1 | —                  | —      | —       | 12.1                                        | 0.06   | 26      | 0.470                            | 0.21   | 13      |
| LNU900                                                                                   | 78851.3 | —                  | —      | —       | 11.3                                        | 0.19   | 18      | —                                | —      | —       |
| LNU898                                                                                   | 78983.4 | —                  | —      | —       | 11.7                                        | 0.11   | 23      | 0.468                            | 0.23   | 13      |
| LNU894                                                                                   | 78283.7 | —                  | —      | —       | 12.4                                        | 0.04   | 29      | —                                | —      | —       |
| LNU846                                                                                   | 78439.4 | —                  | —      | —       | 12.5                                        | 0.03   | 31      | 0.468                            | 0.23   | 13      |
| LNU815                                                                                   | 77494.1 | —                  | —      | —       | 12.7                                        | 0.02   | 33      | —                                | —      | —       |
| LNU811                                                                                   | 78179.1 | —                  | —      | —       | 11.8                                        | 0.10   | 24      | —                                | —      | —       |
| LNU756                                                                                   | 77581.3 | —                  | —      | —       | 11.0                                        | 0.27   | 15      | —                                | —      | —       |
| LNU751                                                                                   | 77477.4 | 0.941              | 0.11   | 18      | —                                           | —      | —       | —                                | —      | —       |
| LNU751                                                                                   | 77478.3 | —                  | —      | —       | 11.1                                        | 0.23   | 16      | —                                | —      | —       |
| CONT.                                                                                    | —       | 0.800              | —      | —       | 9.56                                        | —      | —       | 0.415                            | —      | —       |
| LNU965                                                                                   | 78360.5 | —                  | —      | —       | 13.7                                        | 0.11   | 20      | 0.534                            | 0.16   | 10      |
| LNU943                                                                                   | 78407.2 | —                  | —      | —       | 13.4                                        | 0.16   | 17      | —                                | —      | —       |
| LNU913                                                                                   | 78593.1 | —                  | —      | —       | 14.0                                        | 0.07   | 23      | —                                | —      | —       |
| CONT.                                                                                    | —       | —                  | —      | —       | 11.4                                        | —      | —       | 0.487                            | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

The genes listed in Tables 126-127 improved plant NUE when grown at standard nitrogen concentration levels. These genes produced larger plants with a larger photosynthetic area and increased biomass (fresh weight, dry weight, leaf

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number, rosette diameter, rosette area and plot coverage) when grown under standard nitrogen conditions as compared to control plants grown under identical growth conditions.

TABLE 126

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU966                                                                                 | 78605.5 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.07   | 5       |
| LNU941                                                                                 | 78611.1 | —               | —      | —       | 3018.8            | 0.07   | 7       | —           | —      | —       |
| LNU941                                                                                 | 78613.1 | —               | —      | —       | 2987.5            | 0.15   | 5       | 11.9        | 0.30   | 2       |
| LNU941                                                                                 | 78614.2 | —               | —      | —       | 3137.5            | L      | 11      | —           | —      | —       |
| LNU941                                                                                 | 78615.3 | —               | —      | —       | —                 | —      | —       | 13.1        | L      | 13      |
| LNU925                                                                                 | 78991.7 | —               | —      | —       | —                 | —      | —       | 12.6        | 0.03   | 8       |
| LNU925                                                                                 | 78992.1 | 230.6           | 0.28   | 4       | 3031.2            | 0.21   | 7       | 12.2        | 0.28   | 6       |
| LNU925                                                                                 | 78992.6 | —               | —      | —       | 2957.1            | 0.17   | 4       | —           | —      | —       |
| LNU922                                                                                 | 78290.1 | —               | —      | —       | 2943.8            | 0.27   | 4       | 12.9        | 0.11   | 11      |
| LNU918                                                                                 | 78433.3 | 238.6           | 0.23   | 8       | —                 | —      | —       | —           | —      | —       |
| LNU918                                                                                 | 78433.8 | —               | —      | —       | 3156.2            | 0.06   | 11      | —           | —      | —       |
| LNU918                                                                                 | 78434.2 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.19   | 8       |
| LNU915                                                                                 | 78426.1 | 236.2           | 0.25   | 7       | —                 | —      | —       | 12.4        | 0.04   | 7       |
| LNU915                                                                                 | 78428.1 | 242.5           | 0.30   | 10      | 3131.2            | 0.13   | 11      | 12.3        | 0.06   | 6       |
| LNU915                                                                                 | 78428.2 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.05   | 5       |
| LNU909                                                                                 | 78424.3 | 236.2           | 0.16   | 7       | —                 | —      | —       | 12.9        | L      | 12      |
| LNU909                                                                                 | 78425.4 | —               | —      | —       | —                 | —      | —       | 12.6        | L      | 9       |
| LNU909                                                                                 | 78425.7 | —               | —      | —       | —                 | —      | —       | 12.4        | L      | 7       |
| LNU890                                                                                 | 78202.1 | —               | —      | —       | —                 | —      | —       | 12.3        | 0.01   | 6       |
| LNU854                                                                                 | 78238.1 | —               | —      | —       | —                 | —      | —       | 12.0        | 0.15   | 4       |
| LNU849                                                                                 | 78498.4 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.10   | 7       |
| LNU849                                                                                 | 78499.1 | —               | —      | —       | 2981.2            | 0.27   | 5       | —           | —      | —       |
| LNU849                                                                                 | 78500.3 | 234.4           | 0.16   | 6       | —                 | —      | —       | —           | —      | —       |
| LNU830                                                                                 | 78741.3 | —               | —      | —       | —                 | —      | —       | 12.0        | 0.11   | 4       |
| LNU830                                                                                 | 78741.5 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.07   | 5       |
| LNU824                                                                                 | 77826.1 | 235.6           | 0.11   | 6       | —                 | —      | —       | 12.6        | 0.16   | 9       |
| LNU822                                                                                 | 78623.2 | —               | —      | —       | 2943.8            | 0.22   | 4       | 12.8        | 0.01   | 11      |
| LNU822                                                                                 | 78623.6 | —               | —      | —       | 2937.5            | 0.25   | 4       | 11.9        | 0.30   | 2       |
| LNU822                                                                                 | 78625.2 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.17   | 3       |

TABLE 126-continued

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU822                                                                                 | 78625.7 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.05   | 5       |
| LNU813                                                                                 | 77682.3 | —               | —      | —       | —                 | —      | —       | 12.7        | 0.19   | 9       |
| LNU806                                                                                 | 78515.4 | —               | —      | —       | —                 | —      | —       | 12.9        | L      | 12      |
| LNU806                                                                                 | 78515.5 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.15   | 6       |
| LNU802                                                                                 | 80310.1 | 239.4           | 0.07   | 8       | —                 | —      | —       | —           | —      | —       |
| LNU779                                                                                 | 77887.2 | —               | —      | —       | —                 | —      | —       | 12.1        | 0.17   | 4       |
| LNU779                                                                                 | 77887.3 | —               | —      | —       | —                 | —      | —       | 12.6        | 0.12   | 8       |
| LNU761                                                                                 | 78159.1 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.29   | 3       |
| LNU761                                                                                 | 78160.3 | 235.0           | 0.19   | 6       | —                 | —      | —       | 12.5        | 0.08   | 8       |
| CONT.                                                                                  | —       | 221.4           | —      | —       | 2832.1            | —      | —       | 11.6        | —      | —       |
| LNU976                                                                                 | 78364.1 | —               | —      | —       | —                 | —      | —       | 9.75        | 0.11   | 5       |
| LNU976                                                                                 | 78364.2 | —               | —      | —       | —                 | —      | —       | 9.75        | 0.11   | 5       |
| LNU976                                                                                 | 78364.5 | —               | —      | —       | —                 | —      | —       | 9.69        | 0.22   | 5       |
| LNU843                                                                                 | 78962.4 | —               | —      | —       | —                 | —      | —       | 9.56        | 0.25   | 3       |
| LNU790                                                                                 | 78890.3 | —               | —      | —       | —                 | —      | —       | 9.81        | 0.28   | 6       |
| CONT.                                                                                  | —       | —               | —      | —       | —                 | —      | —       | 9.27        | —      | —       |
| LNU966                                                                                 | 78605.5 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.02   | 8       |
| LNU941                                                                                 | 78613.1 | 403.2           | 0.03   | 14      | 5655.4            | 0.16   | 19      | 11.5        | 0.15   | 4       |
| LNU941                                                                                 | 78614.2 | —               | —      | —       | 5047.3            | 0.24   | 6       | 12.1        | 0.04   | 10      |
| LNU941                                                                                 | 78615.3 | 377.9           | 0.24   | 7       | —                 | —      | —       | —           | —      | —       |
| LNU915                                                                                 | 78427.1 | —               | —      | —       | 5133.3            | 0.12   | 8       | —           | —      | —       |
| LNU915                                                                                 | 78428.1 | 373.8           | 0.27   | 5       | 5237.5            | 0.21   | 10      | —           | —      | —       |
| LNU915                                                                                 | 78428.2 | —               | —      | —       | 5231.2            | 0.17   | 10      | —           | —      | —       |
| LNU854                                                                                 | 78238.1 | —               | —      | —       | 5087.5            | 0.15   | 7       | 11.9        | 0.02   | 8       |
| LNU849                                                                                 | 78499.1 | —               | —      | —       | —                 | —      | —       | 11.4        | 0.17   | 4       |
| LNU849                                                                                 | 78500.1 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.06   | 7       |
| LNU830                                                                                 | 78741.5 | —               | —      | —       | —                 | —      | —       | 12.3        | L      | 12      |
| LNU830                                                                                 | 78742.6 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.02   | 7       |
| LNU813                                                                                 | 77681.4 | —               | —      | —       | —                 | —      | —       | 11.5        | 0.15   | 4       |
| LNU806                                                                                 | 78514.2 | —               | —      | —       | 5231.2            | 0.08   | 10      | 11.4        | 0.26   | 4       |
| LNU806                                                                                 | 78515.3 | —               | —      | —       | —                 | —      | —       | 11.5        | 0.27   | 4       |
| LNU780                                                                                 | 77489.4 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.15   | 5       |
| LNU751                                                                                 | 77477.4 | —               | —      | —       | —                 | —      | —       | 11.4        | 0.23   | 3       |
| LNU751                                                                                 | 77480.1 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.18   | 5       |
| CONT.                                                                                  | —       | 354.5           | —      | —       | 4755.4            | —      | —       | 11.0        | —      | —       |
| LNU948                                                                                 | 78376.3 | 240.0           | L      | 32      | 2737.5            | L      | 49      | —           | —      | —       |
| LNU948                                                                                 | 78378.1 | 226.2           | 0.03   | 24      | 2212.5            | 0.13   | 20      | 11.8        | 0.05   | 5       |
| LNU921                                                                                 | 79063.2 | —               | —      | —       | —                 | —      | —       | 12.1        | L      | 8       |
| LNU921                                                                                 | 79064.2 | 257.5           | 0.02   | 41      | 2868.8            | L      | 56      | —           | —      | —       |
| LNU921                                                                                 | 79064.3 | 286.2           | L      | 57      | 3000.0            | L      | 63      | 11.8        | 0.23   | 6       |
| LNU912                                                                                 | 78402.3 | 231.9           | 0.04   | 27      | 2581.2            | 0.04   | 40      | —           | —      | —       |
| LNU912                                                                                 | 78405.2 | —               | —      | —       | —                 | —      | —       | 12.3        | 0.19   | 10      |
| LNU889                                                                                 | 79599.1 | 237.5           | 0.07   | 30      | 2681.2            | 0.04   | 46      | 12.1        | 0.18   | 8       |
| LNU889                                                                                 | 79602.4 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.30   | 7       |
| LNU881                                                                                 | 78373.1 | 231.2           | 0.02   | 27      | 2643.8            | L      | 44      | —           | —      | —       |
| LNU881                                                                                 | 78373.2 | 259.4           | 0.06   | 42      | 3143.8            | 0.03   | 71      | 11.9        | 0.13   | 6       |
| LNU881                                                                                 | 78374.1 | —               | —      | —       | —                 | —      | —       | 12.0        | 0.01   | 7       |
| LNU865                                                                                 | 79761.2 | 267.5           | L      | 47      | 3018.8            | L      | 64      | 12.0        | 0.10   | 7       |
| LNU865                                                                                 | 79761.4 | 227.5           | 0.06   | 25      | 2618.8            | 0.17   | 42      | 12.0        | L      | 7       |
| LNU865                                                                                 | 79761.7 | 281.2           | L      | 54      | 3112.5            | L      | 69      | —           | —      | —       |
| LNU857                                                                                 | 78868.2 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.12   | 3       |
| LNU831                                                                                 | 79331.2 | —               | —      | —       | —                 | —      | —       | 11.7        | 0.14   | 5       |
| LNU831                                                                                 | 79333.1 | 265.0           | 0.04   | 45      | 3087.5            | L      | 68      | —           | —      | —       |
| LNU831                                                                                 | 79333.2 | 258.5           | L      | 42      | 2945.8            | L      | 60      | —           | —      | —       |
| LNU816                                                                                 | 78957.1 | 242.5           | L      | 33      | 2956.2            | L      | 61      | —           | —      | —       |
| LNU816                                                                                 | 78958.5 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.03   | 6       |
| LNU816                                                                                 | 78958.7 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.13   | 6       |
| LNU809                                                                                 | 79168.5 | 229.4           | 0.23   | 26      | 2550.0            | 0.02   | 38      | —           | —      | —       |
| LNU807                                                                                 | 79248.1 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.18   | 7       |
| LNU807                                                                                 | 79250.1 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.12   | 3       |
| LNU795                                                                                 | 79521.6 | —               | —      | —       | —                 | —      | —       | 11.4        | 0.27   | 2       |
| LNU795                                                                                 | 79525.1 | 203.1           | 0.21   | 11      | —                 | —      | —       | —           | —      | —       |
| LNU795                                                                                 | 79525.4 | 265.6           | L      | 46      | 2950.0            | L      | 60      | —           | —      | —       |
| LNU788                                                                                 | 78516.1 | 225.6           | 0.03   | 24      | 2437.5            | 0.03   | 32      | —           | —      | —       |
| LNU788                                                                                 | 78517.1 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.08   | 11      |
| LNU788                                                                                 | 78517.2 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.03   | 6       |
| LNU788                                                                                 | 78518.1 | 238.8           | 0.17   | 31      | 2331.2            | 0.07   | 27      | 12.4        | 0.04   | 11      |
| LNU788                                                                                 | 78520.4 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.01   | 7       |
| LNU783                                                                                 | 79178.4 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.23   | 6       |
| LNU778                                                                                 | 78944.1 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.02   | 6       |
| LNU778                                                                                 | 78944.2 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.05   | 5       |
| LNU762                                                                                 | 79328.3 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.11   | 9       |

TABLE 126-continued

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU762                                                                                 | 79329.2 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.02   | 6       |
| LNU752                                                                                 | 78153.1 | 264.4           | L      | 45      | 3043.8            | L      | 65      | 12.1        | L      | 8       |
| LNU752                                                                                 | 78155.2 | —               | —      | —       | —                 | —      | —       | 12.0        | 0.10   | 7       |
| CONT.                                                                                  | —       | 182.3           | —      | —       | 1841.3            | —      | —       | 11.2        | —      | —       |
| LNU977                                                                                 | 77991.4 | —               | —      | —       | 4112.5            | 0.14   | 10      | —           | —      | —       |
| LNU977                                                                                 | 78033.1 | 365.0           | 0.24   | 19      | 4481.2            | 0.24   | 20      | —           | —      | —       |
| LNU880                                                                                 | 78196.1 | 342.5           | 0.02   | 12      | 4043.8            | 0.02   | 9       | —           | —      | —       |
| LNU880                                                                                 | 78197.4 | —               | —      | —       | 3981.2            | 0.03   | 7       | —           | —      | —       |
| LNU871                                                                                 | 78191.1 | 319.4           | 0.24   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU871                                                                                 | 78191.3 | 326.2           | 0.20   | 7       | 4243.8            | L      | 14      | —           | —      | —       |
| LNU848                                                                                 | 77906.2 | —               | —      | —       | 4100.0            | 0.29   | 10      | —           | —      | —       |
| LNU848                                                                                 | 77909.2 | —               | —      | —       | 3987.5            | 0.08   | 7       | —           | —      | —       |
| LNU848                                                                                 | 77909.5 | —               | —      | —       | 4031.2            | 0.09   | 8       | —           | —      | —       |
| LNU846                                                                                 | 78438.1 | 322.1           | 0.18   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU845                                                                                 | 78920.1 | —               | —      | —       | 4000.0            | 0.02   | 7       | —           | —      | —       |
| LNU828                                                                                 | 77600.4 | 331.9           | 0.23   | 9       | 4100.0            | 0.07   | 10      | —           | —      | —       |
| LNU823                                                                                 | 78122.2 | 321.2           | 0.19   | 5       | 3918.8            | 0.10   | 5       | —           | —      | —       |
| LNU823                                                                                 | 78136.1 | 327.5           | 0.28   | 7       | —                 | —      | —       | —           | —      | —       |
| LNU823                                                                                 | 78136.4 | 320.8           | 0.30   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU823                                                                                 | 78137.3 | —               | —      | —       | —                 | —      | —       | 12.3        | 0.11   | 6       |
| LNU772                                                                                 | 78937.4 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.03   | 3       |
| LNU772                                                                                 | 78938.1 | 331.9           | 0.06   | 9       | —                 | —      | —       | 12.8        | 0.01   | 10      |
| LNU757                                                                                 | 77481.1 | —               | —      | —       | 4098.2            | 0.13   | 10      | —           | —      | —       |
| LNU757                                                                                 | 77485.2 | 335.6           | 0.19   | 10      | 4081.2            | 0.28   | 10      | —           | —      | —       |
| LNU757                                                                                 | 77485.4 | 338.1           | 0.02   | 11      | 4250.0            | 0.08   | 14      | —           | —      | —       |
| LNU750                                                                                 | 78863.2 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.23   | 2       |
| CONT.                                                                                  | —       | 305.5           | —      | —       | 3722.0            | —      | —       | 11.6        | —      | —       |
| LNU972                                                                                 | 78907.1 | 386.2           | 0.29   | 7       | 5068.8            | 0.04   | 10      | 11.9        | 0.02   | 6       |
| LNU972                                                                                 | 78909.3 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.29   | 11      |
| LNU961                                                                                 | 79143.3 | —               | —      | —       | —                 | —      | —       | 11.6        | 0.24   | 2       |
| LNU961                                                                                 | 79145.3 | 396.9           | 0.24   | 9       | 5556.2            | L      | 20      | —           | —      | —       |
| LNU961                                                                                 | 79145.8 | —               | —      | —       | 5037.5            | 0.05   | 9       | —           | —      | —       |
| LNU958                                                                                 | 77687.2 | —               | —      | —       | —                 | —      | —       | 12.4        | L      | 9       |
| LNU958                                                                                 | 77687.5 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.05   | 11      |
| LNU958                                                                                 | 77689.1 | —               | —      | —       | —                 | —      | —       | 12.0        | 0.02   | 6       |
| LNU958                                                                                 | 77689.2 | —               | —      | —       | 5093.8            | 0.04   | 10      | —           | —      | —       |
| LNU948                                                                                 | 78379.4 | —               | —      | —       | —                 | —      | —       | 12.1        | L      | 7       |
| LNU948                                                                                 | 78380.2 | —               | —      | —       | 5275.0            | 0.16   | 14      | 12.3        | L      | 9       |
| LNU921                                                                                 | 79063.2 | —               | —      | —       | —                 | —      | —       | 12.5        | L      | 11      |
| LNU921                                                                                 | 79064.3 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.05   | 5       |
| LNU913                                                                                 | 78592.1 | —               | —      | —       | —                 | —      | —       | 12.1        | L      | 7       |
| LNU913                                                                                 | 78592.3 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.16   | 9       |
| LNU913                                                                                 | 78592.4 | —               | —      | —       | —                 | —      | —       | 13.1        | 0.26   | 16      |
| LNU913                                                                                 | 78593.6 | —               | —      | —       | —                 | —      | —       | 13.1        | L      | 16      |
| LNU912                                                                                 | 78403.2 | —               | —      | —       | —                 | —      | —       | 12.0        | 0.02   | 6       |
| LNU912                                                                                 | 78404.1 | 406.9           | L      | 12      | 5300.0            | 0.07   | 15      | —           | —      | —       |
| LNU888                                                                                 | 78772.7 | —               | —      | —       | —                 | —      | —       | 12.3        | 0.02   | 9       |
| LNU881                                                                                 | 78372.2 | —               | —      | —       | 5393.8            | 0.19   | 17      | —           | —      | —       |
| LNU881                                                                                 | 78373.1 | 406.2           | L      | 12      | 5431.2            | L      | 18      | —           | —      | —       |
| LNU881                                                                                 | 78373.2 | —               | —      | —       | —                 | —      | —       | 12.6        | 0.08   | 11      |
| LNU881                                                                                 | 78374.1 | 398.0           | L      | 10      | 5265.2            | L      | 14      | 12.4        | 0.06   | 9       |
| LNU881                                                                                 | 78374.4 | —               | —      | —       | 5157.1            | 0.03   | 12      | —           | —      | —       |
| LNU823                                                                                 | 78136.1 | —               | —      | —       | 5000.0            | 0.06   | 8       | —           | —      | —       |
| LNU823                                                                                 | 78136.4 | 391.2           | 0.03   | 8       | 5093.8            | 0.03   | 10      | —           | —      | —       |
| LNU823                                                                                 | 78137.3 | 390.3           | 0.24   | 8       | 5273.2            | 0.01   | 14      | —           | —      | —       |
| LNU816                                                                                 | 78957.1 | —               | —      | —       | 5250.0            | 0.12   | 14      | 12.1        | 0.18   | 7       |
| LNU816                                                                                 | 78958.7 | —               | —      | —       | —                 | —      | —       | 12.7        | 0.28   | 12      |
| LNU809                                                                                 | 79168.3 | —               | —      | —       | —                 | —      | —       | 11.9        | 0.24   | 6       |
| LNU782                                                                                 | 77441.1 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.04   | 8       |
| LNU782                                                                                 | 77443.3 | —               | —      | —       | 4943.8            | 0.12   | 7       | —           | —      | —       |
| LNU782                                                                                 | 77444.9 | —               | —      | —       | —                 | —      | —       | 12.6        | 0.20   | 12      |
| LNU772                                                                                 | 78937.4 | —               | —      | —       | 4962.5            | 0.08   | 8       | —           | —      | —       |
| LNU772                                                                                 | 78938.1 | 387.5           | 0.16   | 7       | —                 | —      | —       | 12.4        | L      | 9       |
| LNU772                                                                                 | 78940.2 | —               | —      | —       | —                 | —      | —       | 12.6        | 0.04   | 12      |
| LNU762                                                                                 | 79330.3 | —               | —      | —       | 5019.6            | 0.22   | 9       | —           | —      | —       |
| LNU757                                                                                 | 77481.1 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.05   | 11      |
| LNU757                                                                                 | 77483.2 | —               | —      | —       | —                 | —      | —       | 11.8        | 0.14   | 5       |
| LNU757                                                                                 | 77485.2 | —               | —      | —       | 4937.5            | 0.13   | 7       | —           | —      | —       |
| LNU757                                                                                 | 77485.4 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.04   | 8       |
| CONT.                                                                                  | —       | 362.5           | —      | —       | 4614.3            | —      | —       | 11.3        | —      | —       |
| LNU933                                                                                 | 78900.5 | —               | —      | —       | 2568.8            | 0.23   | 6       | —           | —      | —       |
| LNU907                                                                                 | 78872.3 | —               | —      | —       | 2850.0            | 0.08   | 17      | —           | —      | —       |

TABLE 126-continued

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU907                                                                                 | 78872.8 | —               | —      | —       | 2662.5            | 0.04   | 9       | —           | —      | —       |
| LNU882                                                                                 | 78973.4 | —               | —      | —       | —                 | —      | —       | 13.8        | 0.11   | 8       |
| LNU871                                                                                 | 78195.4 | 286.2           | 0.13   | 13      | 2625.0            | 0.21   | 8       | —           | —      | —       |
| LNU865                                                                                 | 79761.2 | 271.9           | 0.25   | 7       | —                 | —      | —       | —           | —      | —       |
| LNU857                                                                                 | 78867.2 | —               | —      | —       | 2622.3            | 0.08   | 8       | —           | —      | —       |
| LNU848                                                                                 | 77909.3 | —               | —      | —       | —                 | —      | —       | 13.2        | 0.08   | 4       |
| LNU847                                                                                 | 78967.4 | —               | —      | —       | 2687.5            | 0.30   | 10      | —           | —      | —       |
| LNU835                                                                                 | 78186.6 | —               | —      | —       | 2731.2            | 0.29   | 12      | —           | —      | —       |
| LNU835                                                                                 | 78187.2 | —               | —      | —       | 2706.2            | 0.12   | 11      | —           | —      | —       |
| LNU835                                                                                 | 78189.1 | —               | —      | —       | 2637.5            | 0.06   | 8       | —           | —      | —       |
| LNU828                                                                                 | 77600.4 | —               | —      | —       | 2718.8            | 0.05   | 12      | —           | —      | —       |
| LNU807                                                                                 | 79250.1 | —               | —      | —       | —                 | —      | —       | 13.3        | 0.12   | 4       |
| LNU798                                                                                 | 79671.4 | —               | —      | —       | —                 | —      | —       | 13.1        | 0.20   | 2       |
| LNU795                                                                                 | 79521.3 | 295.6           | 0.03   | 17      | 2650.0            | 0.05   | 9       | —           | —      | —       |
| LNU795                                                                                 | 79525.4 | —               | —      | —       | 2556.2            | 0.24   | 5       | —           | —      | —       |
| LNU766                                                                                 | 78931.2 | —               | —      | —       | —                 | —      | —       | 13.1        | 0.20   | 2       |
| LNU766                                                                                 | 78932.1 | 291.9           | 0.03   | 15      | 2937.5            | L      | 21      | 13.3        | 0.03   | 4       |
| LNU752                                                                                 | 78153.1 | —               | —      | —       | 2662.5            | 0.04   | 9       | —           | —      | —       |
| LNU750                                                                                 | 78863.3 | —               | —      | —       | 2650.0            | 0.13   | 9       | —           | —      | —       |
| CONT.                                                                                  | 253.4   | —               | —      | —       | 2433.9            | —      | —       | 12.8        | —      | —       |
| LNU976                                                                                 | 78364.1 | —               | —      | —       | 3637.5            | 0.27   | 11      | —           | —      | —       |
| LNU976                                                                                 | 78364.2 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.14   | 3       |
| LNU970                                                                                 | 78389.8 | 276.2           | 0.11   | 12      | 3700.0            | L      | 13      | —           | —      | —       |
| LNU968                                                                                 | 77917.3 | —               | —      | —       | 3470.5            | 0.12   | 6       | —           | —      | —       |
| LNU967                                                                                 | 79001.1 | —               | —      | —       | 3493.8            | 0.14   | 7       | —           | —      | —       |
| LNU967                                                                                 | 79002.4 | 258.1           | 0.07   | 5       | 3511.6            | 0.24   | 8       | —           | —      | —       |
| LNU963                                                                                 | 78383.4 | 255.0           | 0.22   | 4       | 3668.8            | L      | 12      | —           | —      | —       |
| LNU963                                                                                 | 78384.2 | 268.8           | 0.02   | 9       | 3493.8            | 0.11   | 7       | —           | —      | —       |
| LNU950                                                                                 | 78915.2 | 263.1           | 0.06   | 7       | 3581.2            | 0.06   | 10      | —           | —      | —       |
| LNU934                                                                                 | 79007.5 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.09   | 3       |
| LNU908                                                                                 | 79734.4 | —               | —      | —       | 3443.8            | 0.14   | 6       | 12.1        | 0.29   | 2       |
| LNU908                                                                                 | 79736.2 | —               | —      | —       | 3525.0            | 0.18   | 8       | —           | —      | —       |
| LNU908                                                                                 | 79736.4 | 258.1           | 0.21   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU902                                                                                 | 79604.2 | 256.2           | 0.24   | 4       | 3600.0            | 0.11   | 10      | —           | —      | —       |
| LNU902                                                                                 | 79604.4 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.03   | 5       |
| LNU902                                                                                 | 79606.1 | —               | —      | —       | 3518.8            | 0.05   | 8       | —           | —      | —       |
| LNU885                                                                                 | 78416.1 | —               | —      | —       | 3481.2            | 0.08   | 7       | —           | —      | —       |
| LNU885                                                                                 | 78416.5 | —               | —      | —       | 3437.5            | 0.14   | 5       | —           | —      | —       |
| LNU885                                                                                 | 78419.3 | 261.9           | 0.04   | 6       | 3475.0            | 0.15   | 7       | —           | —      | —       |
| LNU885                                                                                 | 78420.1 | 265.6           | 0.01   | 8       | 3718.8            | L      | 14      | —           | —      | —       |
| LNU879                                                                                 | 77799.2 | —               | —      | —       | 3481.2            | 0.08   | 7       | —           | —      | —       |
| LNU879                                                                                 | 77799.3 | 259.4           | 0.24   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU875                                                                                 | 78413.4 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.07   | 4       |
| LNU875                                                                                 | 78415.1 | —               | —      | —       | 3562.5            | 0.24   | 9       | —           | —      | —       |
| LNU858                                                                                 | 79584.2 | —               | —      | —       | 3625.0            | 0.15   | 11      | —           | —      | —       |
| LNU858                                                                                 | 79585.1 | 263.3           | 0.02   | 7       | 3747.3            | 0.05   | 15      | —           | —      | —       |
| LNU858                                                                                 | 79586.3 | 275.0           | 0.28   | 12      | —                 | —      | —       | 12.4        | 0.22   | 4       |
| LNU790                                                                                 | 78889.2 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.16   | 5       |
| LNU790                                                                                 | 78890.1 | 268.1           | 0.11   | 9       | 3662.5            | 0.08   | 12      | —           | —      | —       |
| LNU790                                                                                 | 78890.3 | —               | —      | —       | 3400.0            | 0.25   | 4       | 12.6        | 0.07   | 6       |
| LNU767                                                                                 | 79146.1 | —               | —      | —       | —                 | —      | —       | 12.3        | 0.06   | 4       |
| LNU767                                                                                 | 79146.2 | 263.1           | 0.02   | 7       | 3506.2            | 0.08   | 7       | 12.3        | 0.18   | 4       |
| CONT.                                                                                  | 246.0   | —               | —      | —       | 3262.5            | —      | —       | 11.9        | —      | —       |
| LNU947                                                                                 | 77446.1 | 318.8           | 0.02   | 8       | 3731.2            | 0.11   | 5       | —           | —      | —       |
| LNU947                                                                                 | 77447.3 | 318.1           | 0.02   | 8       | 3737.5            | 0.03   | 5       | 12.5        | 0.07   | 4       |
| LNU940                                                                                 | 77812.4 | —               | —      | —       | 3737.5            | 0.03   | 5       | —           | —      | —       |
| LNU900                                                                                 | 78851.3 | 317.5           | 0.11   | 8       | 3800.0            | 0.03   | 7       | —           | —      | —       |
| LNU900                                                                                 | 78852.5 | —               | —      | —       | 3678.6            | 0.11   | 3       | —           | —      | —       |
| LNU900                                                                                 | 78854.3 | 314.4           | 0.09   | 7       | —                 | —      | —       | —           | —      | —       |
| LNU898                                                                                 | 78981.3 | 322.1           | 0.01   | 9       | 3873.2            | 0.11   | 9       | 12.4        | 0.14   | 3       |
| LNU898                                                                                 | 78983.4 | 325.6           | 0.01   | 10      | 3843.8            | L      | 8       | 12.4        | 0.05   | 3       |
| LNU898                                                                                 | 78985.1 | 308.1           | 0.14   | 5       | 3750.0            | 0.07   | 5       | —           | —      | —       |
| LNU898                                                                                 | 78985.4 | —               | —      | —       | 3656.2            | 0.18   | 3       | —           | —      | —       |
| LNU894                                                                                 | 78282.3 | —               | —      | —       | 3750.0            | 0.07   | 5       | 12.6        | 0.20   | 5       |
| LNU894                                                                                 | 78283.4 | 316.2           | 0.13   | 7       | 3718.8            | 0.18   | 5       | —           | —      | —       |
| LNU894                                                                                 | 78283.7 | 322.5           | 0.10   | 9       | 3775.0            | 0.16   | 6       | 12.8        | L      | 6       |
| LNU846                                                                                 | 78436.2 | 323.8           | L      | 10      | 3825.0            | 0.02   | 8       | —           | —      | —       |
| LNU820                                                                                 | 77807.2 | 325.0           | 0.19   | 10      | 3737.5            | 0.05   | 5       | —           | —      | —       |
| LNU815                                                                                 | 77492.2 | —               | —      | —       | 3712.5            | 0.06   | 4       | —           | —      | —       |
| LNU815                                                                                 | 77492.6 | 315.6           | 0.24   | 7       | 3818.8            | 0.10   | 7       | 12.5        | 0.07   | 4       |
| LNU815                                                                                 | 77494.1 | —               | —      | —       | —                 | —      | —       | 13.1        | 0.14   | 9       |
| LNU815                                                                                 | 77495.3 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.02   | 4       |

TABLE 126-continued

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                 |        |         |                   |        |         |             |        |         |
|----------------------------------------------------------------------------------------|---------|-----------------|--------|---------|-------------------|--------|---------|-------------|--------|---------|
| Gene Name                                                                              | Event # | Dry Weight [mg] |        |         | Fresh Weight [mg] |        |         | Leaf Number |        |         |
|                                                                                        |         | Ave.            | P-Val. | % Incr. | Ave.              | P-Val. | % Incr. | Ave.        | P-Val. | % Incr. |
| LNU814                                                                                 | 78953.2 | —               | —      | —       | —                 | —      | —       | 12.7        | 0.09   | 5       |
| LNU814                                                                                 | 78953.3 | 311.9           | 0.13   | 6       | —                 | —      | —       | —           | —      | —       |
| LNU814                                                                                 | 78955.4 | —               | —      | —       | —                 | —      | —       | 12.6        | 0.14   | 4       |
| LNU811                                                                                 | 78176.1 | —               | —      | —       | 3775.0            | 0.02   | 6       | —           | —      | —       |
| LNU811                                                                                 | 78176.8 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.05   | 3       |
| LNU797                                                                                 | 78025.2 | —               | —      | —       | 3916.1            | L      | 10      | —           | —      | —       |
| LNU797                                                                                 | 78025.3 | —               | —      | —       | 3812.5            | 0.05   | 7       | —           | —      | —       |
| LNU793                                                                                 | 78166.4 | 303.8           | 0.29   | 3       | —                 | —      | —       | —           | —      | —       |
| LNU793                                                                                 | 78167.2 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.14   | 3       |
| LNU793                                                                                 | 78169.1 | —               | —      | —       | —                 | —      | —       | 12.5        | 0.27   | 4       |
| LNU780                                                                                 | 77489.4 | —               | —      | —       | 3689.6            | 0.28   | 4       | —           | —      | —       |
| LNU776                                                                                 | 79747.1 | —               | —      | —       | 3834.5            | 0.28   | 8       | —           | —      | —       |
| LNU769                                                                                 | 78163.8 | 308.1           | 0.27   | 5       | —                 | —      | —       | —           | —      | —       |
| LNU769                                                                                 | 78165.2 | 327.5           | 0.13   | 11      | 3681.2            | 0.13   | 4       | —           | —      | —       |
| LNU759                                                                                 | 77236.2 | —               | —      | —       | 3632.1            | 0.30   | 2       | —           | —      | —       |
| LNU759                                                                                 | 77236.8 | 312.5           | 0.06   | 6       | 3825.0            | 0.08   | 8       | —           | —      | —       |
| LNU751                                                                                 | 77477.1 | —               | —      | —       | 3806.2            | L      | 7       | —           | —      | —       |
| LNU751                                                                                 | 77478.3 | 308.1           | 0.14   | 5       | —                 | —      | —       | —           | —      | —       |
| CONT.                                                                                  | —       | 294.8           | —      | —       | 3555.4            | —      | —       | 12.0        | —      | —       |
| LNU972                                                                                 | 78907.1 | —               | —      | —       | 4868.8            | 0.04   | 12      | —           | —      | —       |
| LNU943                                                                                 | 78407.1 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.13   | 3       |
| LNU943                                                                                 | 78407.2 | —               | —      | —       | —                 | —      | —       | 12.2        | 0.29   | 2       |
| LNU913                                                                                 | 78592.1 | —               | —      | —       | —                 | —      | —       | 12.4        | 0.03   | 3       |
| LNU913                                                                                 | 78592.4 | 432.5           | 0.25   | 17      | 4681.2            | 0.21   | 8       | —           | —      | —       |
| LNU864                                                                                 | 79339.2 | —               | —      | —       | 4718.8            | 0.12   | 9       | —           | —      | —       |
| LNU850                                                                                 | 78638.7 | —               | —      | —       | 4837.5            | 0.05   | 11      | —           | —      | —       |
| LNU768                                                                                 | 77883.4 | —               | —      | —       | 4587.5            | 0.30   | 6       | —           | —      | —       |
| CONT.                                                                                  | —       | 368.8           | —      | —       | 4341.1            | —      | —       | 12.0        | —      | —       |

“CONT.”—Control;

“Ave.”—Average;

“% Incr.” = % increment;

“p-val.”—p-value;

L means that p-value is less than 0.01,  $p < 0.1$  was considered as significant.

TABLE 127

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                                  |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------|---------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                              | Event # | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                        |         | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU966                                                                                 | 78604.1 | 87.4                             | 0.28   | 11      | 10.9                            | 0.28   | 11      | 5.52                  | 0.28   | 7       |
| LNU966                                                                                 | 78605.5 | 87.3                             | 0.17   | 11      | 10.9                            | 0.17   | 11      | —                     | —      | —       |
| LNU941                                                                                 | 78615.3 | 87.8                             | 0.29   | 12      | 11.0                            | 0.29   | 12      | —                     | —      | —       |
| LNU918                                                                                 | 78434.2 | —                                | —      | —       | —                               | —      | —       | 5.48                  | 0.19   | 6       |
| LNU915                                                                                 | 78426.1 | 91.7                             | 0.26   | 17      | 11.5                            | 0.26   | 17      | 5.74                  | 0.21   | 11      |
| LNU915                                                                                 | 78428.1 | 94.7                             | 0.03   | 20      | 11.8                            | 0.03   | 20      | 5.69                  | 0.06   | 10      |
| LNU909                                                                                 | 78424.3 | 96.2                             | 0.24   | 22      | 12.0                            | 0.24   | 22      | 5.78                  | 0.11   | 12      |
| LNU830                                                                                 | 78741.5 | —                                | —      | —       | —                               | —      | —       | 5.51                  | 0.24   | 7       |
| LNU824                                                                                 | 77826.1 | 87.0                             | 0.18   | 11      | 10.9                            | 0.18   | 11      | —                     | —      | —       |
| LNU822                                                                                 | 78623.7 | 91.8                             | 0.28   | 17      | 11.5                            | 0.28   | 17      | 5.61                  | 0.29   | 8       |
| LNU806                                                                                 | 78515.4 | 86.7                             | 0.19   | 10      | 10.8                            | 0.19   | 10      | 5.49                  | 0.17   | 6       |
| LNU806                                                                                 | 78515.5 | 100.9                            | 0.19   | 28      | 12.6                            | 0.19   | 28      | 5.96                  | 0.27   | 15      |
| CONT.                                                                                  | —       | 78.6                             | —      | —       | 9.83                            | —      | —       | 5.17                  | —      | —       |
| LNU976                                                                                 | 78364.1 | 42.6                             | L      | 44      | 5.33                            | L      | 44      | 4.05                  | L      | 24      |
| LNU976                                                                                 | 78364.5 | 35.5                             | 0.01   | 20      | 4.44                            | 0.01   | 20      | 3.64                  | 0.02   | 11      |
| LNU970                                                                                 | 78388.1 | 35.7                             | 0.02   | 21      | 4.46                            | 0.02   | 21      | 3.70                  | 0.15   | 13      |
| LNU970                                                                                 | 78389.2 | —                                | —      | —       | —                               | —      | —       | 3.39                  | 0.16   | 3       |
| LNU970                                                                                 | 78389.8 | 36.1                             | 0.18   | 22      | 4.81                            | L      | 30      | 3.80                  | L      | 16      |
| LNU970                                                                                 | 78390.3 | —                                | —      | —       | —                               | —      | —       | 3.41                  | 0.10   | 4       |
| LNU968                                                                                 | 77918.3 | 33.3                             | 0.15   | 13      | 4.17                            | 0.15   | 13      | 3.46                  | 0.26   | 6       |
| LNU968                                                                                 | 77919.4 | 35.9                             | L      | 21      | 4.49                            | L      | 21      | 3.64                  | L      | 11      |
| LNU963                                                                                 | 78383.4 | 32.2                             | 0.07   | 9       | 4.03                            | 0.07   | 9       | 3.43                  | 0.18   | 5       |
| LNU963                                                                                 | 78385.1 | 34.1                             | 0.20   | 15      | 4.26                            | 0.20   | 15      | 3.53                  | 0.21   | 8       |
| LNU950                                                                                 | 78913.4 | —                                | —      | —       | —                               | —      | —       | 3.46                  | 0.29   | 6       |
| LNU949                                                                                 | 80557.4 | 33.2                             | 0.15   | 12      | 4.15                            | 0.15   | 12      | 3.51                  | 0.23   | 7       |
| LNU934                                                                                 | 79007.5 | 32.9                             | 0.10   | 11      | 4.11                            | 0.10   | 11      | —                     | —      | —       |

TABLE 127-continued

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                                  |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------|---------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                              | Event # | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                        |         | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU934                                                                                 | 79008.1 | 32.7                             | 0.22   | 10      | 4.09                            | 0.22   | 10      | 3.48                  | 0.20   | 6       |
| LNU902                                                                                 | 79606.5 | —                                | —      | —       | —                               | —      | —       | 3.77                  | 0.26   | 15      |
| LNU843                                                                                 | 78962.4 | 33.8                             | 0.24   | 14      | 4.23                            | 0.24   | 14      | —                     | —      | —       |
| LNU790                                                                                 | 78886.3 | 31.7                             | 0.19   | 7       | 3.96                            | 0.19   | 7       | 3.39                  | 0.16   | 4       |
| LNU790                                                                                 | 78890.1 | 35.0                             | L      | 18      | 4.38                            | L      | 18      | 3.62                  | L      | 10      |
| LNU787                                                                                 | 80547.3 | 31.4                             | 0.21   | 6       | 3.92                            | 0.21   | 6       | 3.43                  | 0.07   | 5       |
| LNU785                                                                                 | 79616.8 | 35.5                             | 0.01   | 20      | 4.43                            | 0.01   | 20      | 3.49                  | 0.02   | 7       |
| LNU767                                                                                 | 79146.1 | 35.0                             | 0.27   | 18      | 4.38                            | 0.27   | 18      | —                     | —      | —       |
| LNU767                                                                                 | 79146.2 | 33.5                             | 0.03   | 13      | 4.18                            | 0.03   | 13      | 3.49                  | 0.02   | 7       |
| CONT.                                                                                  | —       | 29.6                             | —      | —       | 3.70                            | —      | —       | 3.27                  | —      | —       |
| LNU941                                                                                 | 78613.1 | 105.6                            | 0.15   | 14      | 13.2                            | 0.15   | 13      | 6.16                  | 0.13   | 7       |
| LNU915                                                                                 | 78428.1 | —                                | —      | —       | —                               | —      | —       | 6.18                  | 0.26   | 7       |
| LNU909                                                                                 | 78425.4 | —                                | —      | —       | —                               | —      | —       | 6.08                  | 0.25   | 6       |
| LNU830                                                                                 | 78741.3 | 123.8                            | 0.21   | 34      | 16.5                            | 0.01   | 41      | 6.88                  | L      | 19      |
| LNU830                                                                                 | 78741.5 | 127.1                            | L      | 38      | 15.9                            | L      | 36      | 6.74                  | 0.01   | 17      |
| LNU830                                                                                 | 78742.6 | 103.8                            | 0.23   | 12      | 13.0                            | 0.25   | 11      | 6.03                  | 0.29   | 5       |
| LNU813                                                                                 | 77681.4 | 115.6                            | 0.16   | 25      | 14.4                            | 0.18   | 24      | 6.63                  | 0.03   | 15      |
| CONT.                                                                                  | —       | 92.4                             | —      | —       | 11.7                            | —      | —       | 5.76                  | —      | —       |
| LNU948                                                                                 | 78376.3 | 94.8                             | 0.03   | 23      | 11.9                            | 0.03   | 23      | 5.98                  | 0.17   | 11      |
| LNU948                                                                                 | 78378.1 | 103.6                            | 0.11   | 34      | 13.0                            | 0.11   | 34      | 6.04                  | 0.15   | 12      |
| LNU921                                                                                 | 79063.2 | 93.0                             | 0.02   | 20      | 11.6                            | 0.02   | 20      | 5.65                  | 0.14   | 5       |
| LNU921                                                                                 | 79064.2 | 97.5                             | L      | 26      | 12.2                            | L      | 26      | 6.27                  | L      | 16      |
| LNU921                                                                                 | 79064.3 | 109.9                            | L      | 42      | 13.7                            | L      | 42      | 6.10                  | L      | 13      |
| LNU889                                                                                 | 79599.1 | 91.9                             | 0.01   | 19      | 11.5                            | 0.01   | 19      | 5.75                  | 0.05   | 7       |
| LNU889                                                                                 | 79602.4 | 86.1                             | 0.08   | 11      | 10.8                            | 0.08   | 11      | 5.58                  | 0.29   | 3       |
| LNU888                                                                                 | 78771.1 | 84.6                             | 0.27   | 9       | 10.6                            | 0.27   | 9       | —                     | —      | —       |
| LNU881                                                                                 | 78372.2 | 94.2                             | L      | 22      | 11.8                            | L      | 22      | 5.94                  | L      | 10      |
| LNU881                                                                                 | 78373.1 | 95.7                             | 0.03   | 24      | 12.0                            | 0.03   | 24      | 5.81                  | 0.04   | 8       |
| LNU881                                                                                 | 78373.2 | 108.9                            | 0.08   | 41      | 13.6                            | 0.08   | 41      | 6.31                  | 0.14   | 17      |
| LNU881                                                                                 | 78374.1 | 95.8                             | 0.03   | 24      | 12.0                            | 0.03   | 24      | 5.93                  | 0.01   | 10      |
| LNU865                                                                                 | 79761.2 | 129.8                            | L      | 68      | 16.2                            | L      | 68      | 6.89                  | L      | 28      |
| LNU865                                                                                 | 79761.4 | 111.1                            | L      | 44      | 13.9                            | L      | 44      | 6.58                  | 0.03   | 22      |
| LNU865                                                                                 | 79761.7 | 95.8                             | 0.23   | 24      | 12.0                            | 0.23   | 24      | 5.92                  | 0.12   | 10      |
| LNU831                                                                                 | 79333.1 | 93.5                             | 0.11   | 21      | 11.7                            | 0.11   | 21      | 5.88                  | 0.12   | 9       |
| LNU816                                                                                 | 78957.1 | 101.1                            | 0.27   | 31      | 12.6                            | 0.27   | 31      | 6.04                  | 0.02   | 12      |
| LNU816                                                                                 | 78958.5 | 100.6                            | 0.09   | 30      | 12.6                            | 0.09   | 30      | 5.99                  | 0.03   | 11      |
| LNU816                                                                                 | 78958.7 | 95.0                             | L      | 23      | 11.9                            | L      | 23      | 5.82                  | 0.02   | 8       |
| LNU809                                                                                 | 79168.3 | 84.4                             | 0.14   | 9       | 10.5                            | 0.14   | 9       | 5.72                  | 0.07   | 6       |
| LNU809                                                                                 | 79169.5 | 87.1                             | 0.20   | 13      | 10.9                            | 0.20   | 13      | 5.67                  | 0.14   | 5       |
| LNU795                                                                                 | 79525.1 | 92.3                             | 0.07   | 19      | 11.5                            | 0.07   | 19      | 5.85                  | 0.02   | 8       |
| LNU795                                                                                 | 79525.4 | 92.7                             | 0.20   | 20      | 11.6                            | 0.20   | 20      | —                     | —      | —       |
| LNU795                                                                                 | 79525.5 | —                                | —      | —       | —                               | —      | —       | 5.61                  | 0.17   | 4       |
| LNU788                                                                                 | 78516.1 | 110.6                            | 0.06   | 43      | 13.8                            | 0.06   | 43      | 6.25                  | L      | 16      |
| LNU788                                                                                 | 78517.1 | 97.7                             | L      | 26      | 12.2                            | L      | 26      | 5.88                  | 0.01   | 9       |
| LNU788                                                                                 | 78518.1 | 125.2                            | 0.06   | 62      | 15.6                            | 0.06   | 62      | 6.62                  | L      | 23      |
| LNU783                                                                                 | 79178.2 | 85.4                             | 0.15   | 10      | 10.7                            | 0.15   | 10      | 5.58                  | 0.24   | 3       |
| LNU783                                                                                 | 79178.4 | 84.9                             | 0.22   | 10      | 10.6                            | 0.22   | 10      | 5.95                  | 0.02   | 10      |
| LNU778                                                                                 | 78944.1 | 109.0                            | 0.16   | 41      | 13.6                            | 0.16   | 41      | 6.16                  | 0.18   | 14      |
| LNU778                                                                                 | 78944.2 | 87.1                             | 0.06   | 13      | 10.9                            | 0.06   | 13      | 5.61                  | 0.22   | 4       |
| LNU762                                                                                 | 79328.3 | 86.0                             | 0.15   | 11      | 10.7                            | 0.15   | 11      | —                     | —      | —       |
| LNU762                                                                                 | 79330.3 | 82.6                             | 0.26   | 7       | 10.3                            | 0.26   | 7       | —                     | —      | —       |
| LNU752                                                                                 | 78153.1 | —                                | —      | —       | —                               | —      | —       | 6.16                  | 0.22   | 14      |
| LNU752                                                                                 | 78155.2 | 84.2                             | 0.23   | 9       | 10.5                            | 0.23   | 9       | 5.69                  | 0.11   | 5       |
| CONT.                                                                                  | —       | 77.4                             | —      | —       | 9.67                            | —      | —       | 5.40                  | —      | —       |
| LNU882                                                                                 | 78973.4 | 105.5                            | 0.10   | 7       | 13.2                            | 0.10   | 7       | 6.07                  | 0.11   | 4       |
| LNU848                                                                                 | 77906.2 | 112.2                            | 0.07   | 13      | 14.0                            | 0.07   | 13      | 6.37                  | L      | 9       |
| LNU846                                                                                 | 78439.4 | 120.8                            | 0.20   | 22      | 15.1                            | 0.20   | 22      | 6.53                  | L      | 12      |
| LNU823                                                                                 | 78122.2 | —                                | —      | —       | —                               | —      | —       | 6.04                  | 0.19   | 3       |
| LNU823                                                                                 | 78137.3 | 109.4                            | 0.19   | 10      | 13.7                            | 0.19   | 10      | —                     | —      | —       |
| LNU814                                                                                 | 78955.4 | —                                | —      | —       | —                               | —      | —       | 5.99                  | 0.28   | 2       |
| LNU772                                                                                 | 78938.1 | 122.1                            | L      | 23      | 15.3                            | L      | 23      | 6.48                  | 0.11   | 11      |
| LNU757                                                                                 | 77485.4 | 103.0                            | 0.28   | 4       | 12.9                            | 0.28   | 4       | —                     | —      | —       |
| CONT.                                                                                  | —       | 99.0                             | —      | —       | 12.4                            | —      | —       | 5.84                  | —      | —       |
| LNU972                                                                                 | 78907.1 | 77.6                             | 0.27   | 10      | 9.69                            | 0.27   | 10      | —                     | —      | —       |
| LNU972                                                                                 | 78909.3 | 87.4                             | L      | 23      | 10.9                            | L      | 23      | 5.90                  | 0.09   | 13      |
| LNU961                                                                                 | 79143.4 | —                                | —      | —       | —                               | —      | —       | 5.57                  | 0.20   | 7       |
| LNU961                                                                                 | 79145.3 | 80.9                             | 0.10   | 14      | 10.1                            | 0.10   | 14      | 5.50                  | 0.20   | 5       |
| LNU958                                                                                 | 77687.2 | 86.2                             | 0.08   | 22      | 10.8                            | 0.08   | 22      | —                     | —      | —       |
| LNU958                                                                                 | 77687.5 | 88.0                             | 0.05   | 24      | 11.0                            | 0.05   | 24      | 6.04                  | 0.05   | 16      |
| LNU958                                                                                 | 77689.1 | 81.8                             | L      | 16      | 10.2                            | L      | 16      | 5.53                  | 0.02   | 6       |
| LNU948                                                                                 | 78378.1 | 84.7                             | 0.28   | 20      | 10.6                            | 0.28   | 20      | 5.76                  | 0.24   | 10      |
| LNU948                                                                                 | 78379.4 | 75.6                             | 0.14   | 7       | 9.45                            | 0.14   | 7       | —                     | —      | —       |
| LNU948                                                                                 | 78380.2 | 81.3                             | 0.25   | 15      | 10.2                            | 0.25   | 15      | 5.54                  | 0.16   | 6       |

TABLE 127-continued

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                                  |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------|---------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                              | Event # | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                        |         | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU921                                                                                 | 79063.2 | 83.6                             | 0.19   | 18      | 10.4                            | 0.19   | 18      | —                     | —      | —       |
| LNU921                                                                                 | 79064.3 | 83.6                             | L      | 18      | 10.5                            | L      | 18      | 5.65                  | 0.02   | 8       |
| LNU913                                                                                 | 78592.1 | 90.3                             | 0.03   | 28      | 11.3                            | 0.03   | 28      | 5.91                  | L      | 13      |
| LNU913                                                                                 | 78592.3 | 83.4                             | 0.03   | 18      | 10.4                            | 0.03   | 18      | 5.58                  | 0.15   | 7       |
| LNU913                                                                                 | 78592.4 | 90.8                             | L      | 28      | 11.4                            | L      | 28      | 5.79                  | 0.03   | 11      |
| LNU913                                                                                 | 78593.1 | 85.4                             | L      | 21      | 10.7                            | L      | 21      | 5.68                  | L      | 9       |
| LNU913                                                                                 | 78593.6 | 95.2                             | L      | 35      | 11.9                            | L      | 35      | 5.88                  | L      | 13      |
| LNU912                                                                                 | 78403.2 | 81.4                             | L      | 15      | 10.2                            | L      | 15      | 5.70                  | L      | 9       |
| LNU912                                                                                 | 78404.1 | 80.8                             | 0.17   | 14      | 10.1                            | 0.17   | 14      | —                     | —      | —       |
| LNU889                                                                                 | 79599.1 | 74.2                             | 0.29   | 5       | 9.28                            | 0.29   | 5       | —                     | —      | —       |
| LNU889                                                                                 | 79601.4 | 75.9                             | 0.16   | 7       | 9.49                            | 0.16   | 7       | 5.46                  | 0.14   | 5       |
| LNU889                                                                                 | 79602.4 | 74.8                             | 0.21   | 6       | 9.35                            | 0.21   | 6       | 5.43                  | 0.14   | 4       |
| LNU881                                                                                 | 78372.2 | 86.7                             | 0.08   | 22      | 10.8                            | 0.08   | 22      | 5.84                  | L      | 12      |
| LNU881                                                                                 | 78373.2 | 92.0                             | L      | 30      | 11.5                            | L      | 30      | 5.81                  | L      | 11      |
| LNU881                                                                                 | 78374.1 | 79.5                             | 0.14   | 12      | 9.94                            | 0.14   | 12      | —                     | —      | —       |
| LNU823                                                                                 | 78136.4 | 80.5                             | 0.01   | 14      | 10.1                            | 0.01   | 14      | 5.50                  | 0.03   | 5       |
| LNU816                                                                                 | 78957.1 | 86.7                             | 0.03   | 22      | 10.8                            | 0.03   | 22      | 5.78                  | 0.11   | 11      |
| LNU816                                                                                 | 78958.7 | 96.7                             | L      | 37      | 12.1                            | L      | 37      | 6.13                  | L      | 17      |
| LNU809                                                                                 | 79168.3 | 80.8                             | 0.14   | 14      | 10.1                            | 0.14   | 14      | 5.48                  | 0.12   | 5       |
| LNU809                                                                                 | 79169.2 | 80.4                             | 0.01   | 14      | 10.1                            | 0.01   | 14      | 5.48                  | 0.04   | 5       |
| LNU782                                                                                 | 77441.1 | 87.6                             | 0.04   | 24      | 10.9                            | 0.04   | 24      | 5.72                  | 0.02   | 10      |
| LNU782                                                                                 | 77444.2 | 76.2                             | 0.26   | 8       | 9.53                            | 0.26   | 8       | —                     | —      | —       |
| LNU782                                                                                 | 77444.9 | 87.9                             | 0.19   | 24      | 11.0                            | 0.19   | 24      | 5.66                  | 0.07   | 8       |
| LNU772                                                                                 | 78937.4 | 75.5                             | 0.14   | 7       | 9.44                            | 0.14   | 7       | —                     | —      | —       |
| LNU772                                                                                 | 78938.1 | 99.5                             | L      | 41      | 12.4                            | L      | 41      | 6.35                  | 0.03   | 22      |
| LNU772                                                                                 | 78940.2 | 85.8                             | L      | 21      | 10.7                            | L      | 21      | 5.86                  | L      | 12      |
| LNU762                                                                                 | 79329.2 | 75.6                             | 0.24   | 7       | 9.45                            | 0.24   | 7       | —                     | —      | —       |
| CONT.                                                                                  | —       | 70.8                             | —      | —       | 8.85                            | —      | —       | 5.22                  | —      | —       |
| LNU882                                                                                 | 78973.1 | 89.3                             | L      | 19      | 11.2                            | L      | 19      | 5.94                  | 0.20   | 12      |
| LNU882                                                                                 | 78973.4 | 92.0                             | 0.02   | 23      | 11.5                            | 0.02   | 23      | 5.91                  | L      | 11      |
| LNU871                                                                                 | 78195.4 | 78.1                             | 0.18   | 4       | 9.77                            | 0.18   | 4       | 5.45                  | 0.24   | 3       |
| LNU865                                                                                 | 79761.2 | 83.8                             | 0.11   | 12      | 10.5                            | 0.11   | 12      | 5.69                  | 0.06   | 7       |
| LNU865                                                                                 | 79761.7 | 87.1                             | 0.23   | 16      | 10.9                            | 0.23   | 16      | 5.89                  | 0.21   | 11      |
| LNU857                                                                                 | 78867.1 | 84.7                             | 0.17   | 13      | 10.6                            | 0.17   | 13      | 5.79                  | 0.20   | 9       |
| LNU835                                                                                 | 78186.2 | 84.2                             | L      | 12      | 10.5                            | L      | 12      | 5.78                  | 0.02   | 9       |
| LNU807                                                                                 | 79250.1 | 81.1                             | 0.08   | 8       | 10.1                            | 0.08   | 8       | —                     | —      | —       |
| LNU798                                                                                 | 79671.4 | 88.0                             | 0.03   | 17      | 11.0                            | 0.03   | 17      | 5.72                  | 0.08   | 8       |
| LNU795                                                                                 | 79525.4 | 80.8                             | 0.09   | 8       | 10.1                            | 0.09   | 8       | 5.48                  | 0.18   | 3       |
| LNU766                                                                                 | 78931.2 | 84.1                             | 0.07   | 12      | 10.5                            | 0.07   | 12      | 5.71                  | L      | 8       |
| LNU766                                                                                 | 78932.1 | 94.9                             | 0.14   | 27      | 11.9                            | 0.14   | 27      | 5.91                  | 0.06   | 11      |
| CONT.                                                                                  | —       | 74.9                             | —      | —       | 9.36                            | —      | —       | 5.30                  | —      | —       |
| LNU976                                                                                 | 78362.2 | —                                | —      | —       | —                               | —      | —       | 6.38                  | 0.08   | 6       |
| LNU976                                                                                 | 78364.2 | 116.5                            | 0.10   | 14      | 14.6                            | 0.08   | 12      | 6.57                  | 0.02   | 10      |
| LNU970                                                                                 | 78389.8 | 140.6                            | L      | 38      | 17.6                            | L      | 36      | 6.84                  | L      | 14      |
| LNU970                                                                                 | 78390.3 | 119.1                            | 0.06   | 16      | 14.9                            | 0.05   | 15      | 6.53                  | 0.11   | 9       |
| LNU963                                                                                 | 78383.1 | —                                | —      | —       | —                               | —      | —       | 6.31                  | 0.12   | 5       |
| LNU963                                                                                 | 78383.3 | —                                | —      | —       | —                               | —      | —       | 6.28                  | 0.22   | 5       |
| LNU963                                                                                 | 78384.2 | 119.9                            | 0.05   | 17      | 15.0                            | 0.03   | 16      | 6.38                  | 0.07   | 6       |
| LNU934                                                                                 | 79007.5 | 127.0                            | 0.17   | 24      | 15.9                            | 0.19   | 23      | —                     | —      | —       |
| LNU902                                                                                 | 79606.1 | 110.6                            | 0.29   | 8       | 13.8                            | 0.30   | 7       | 6.32                  | 0.11   | 5       |
| LNU885                                                                                 | 78416.1 | 110.6                            | 0.28   | 8       | 13.8                            | 0.28   | 7       | 6.28                  | 0.16   | 5       |
| LNU885                                                                                 | 78419.3 | 111.5                            | 0.24   | 9       | 13.9                            | 0.24   | 8       | 6.42                  | 0.24   | 7       |
| LNU879                                                                                 | 77799.2 | —                                | —      | —       | —                               | —      | —       | 6.25                  | 0.29   | 4       |
| LNU858                                                                                 | 79586.3 | 113.6                            | 0.22   | 11      | 14.2                            | 0.24   | 10      | 6.41                  | 0.06   | 7       |
| LNU858                                                                                 | 79587.2 | —                                | —      | —       | —                               | —      | —       | 6.29                  | 0.16   | 5       |
| LNU790                                                                                 | 78890.1 | 119.7                            | 0.08   | 17      | 15.0                            | 0.08   | 16      | 6.50                  | 0.14   | 8       |
| CONT.                                                                                  | —       | 102.2                            | —      | —       | 12.9                            | —      | —       | 5.99                  | —      | —       |
| LNU947                                                                                 | 77446.1 | 89.3                             | 0.29   | 7       | 11.2                            | 0.29   | 7       | —                     | —      | —       |
| LNU947                                                                                 | 77447.3 | 96.7                             | 0.01   | 16      | 12.1                            | 0.01   | 16      | 5.74                  | 0.16   | 6       |
| LNU947                                                                                 | 77448.4 | 125.6                            | L      | 50      | 15.7                            | L      | 50      | 6.93                  | 0.09   | 28      |
| LNU940                                                                                 | 77812.4 | 95.1                             | 0.04   | 14      | 11.9                            | 0.04   | 14      | 5.79                  | 0.05   | 7       |
| LNU940                                                                                 | 77813.1 | 106.9                            | L      | 28      | 13.4                            | L      | 28      | 6.02                  | L      | 11      |
| LNU900                                                                                 | 78851.3 | 101.5                            | 0.03   | 21      | 12.7                            | 0.03   | 21      | 5.85                  | 0.07   | 8       |
| LNU900                                                                                 | 78854.3 | 95.3                             | 0.05   | 14      | 11.9                            | 0.05   | 14      | 6.01                  | 0.07   | 11      |
| LNU898                                                                                 | 78983.4 | 104.6                            | L      | 25      | 13.1                            | L      | 25      | 6.00                  | 0.02   | 11      |
| LNU898                                                                                 | 78985.1 | 97.5                             | 0.30   | 16      | 12.2                            | 0.30   | 16      | —                     | —      | —       |
| LNU898                                                                                 | 78985.4 | 92.5                             | 0.09   | 10      | 11.6                            | 0.09   | 10      | 5.65                  | 0.18   | 4       |
| LNU894                                                                                 | 78283.7 | 106.3                            | 0.28   | 27      | 13.3                            | 0.28   | 27      | —                     | —      | —       |
| LNU846                                                                                 | 78439.4 | 114.8                            | 0.19   | 37      | 14.4                            | 0.19   | 37      | 6.41                  | 0.17   | 18      |
| LNU820                                                                                 | 77807.2 | 100.2                            | L      | 20      | 12.5                            | L      | 20      | 6.00                  | L      | 11      |
| LNU815                                                                                 | 77494.1 | 113.0                            | L      | 35      | 14.1                            | L      | 35      | 6.26                  | L      | 15      |
| LNU815                                                                                 | 77495.3 | 91.5                             | 0.07   | 9       | 11.4                            | 0.07   | 9       | 5.77                  | 0.13   | 6       |
| LNU814                                                                                 | 78953.2 | 100.2                            | 0.12   | 20      | 12.5                            | 0.12   | 20      | 5.94                  | 0.19   | 10      |

TABLE 127-continued

| Genes showing improved plant biomass production at standard nitrogen growth conditions |         |                                  |        |         |                                 |        |         |                       |        |         |
|----------------------------------------------------------------------------------------|---------|----------------------------------|--------|---------|---------------------------------|--------|---------|-----------------------|--------|---------|
| Gene Name                                                                              | Event # | Plot Coverage [cm <sup>2</sup> ] |        |         | Rosette Area [cm <sup>2</sup> ] |        |         | Rosette Diameter [cm] |        |         |
|                                                                                        |         | Ave.                             | P-Val. | % Incr. | Ave.                            | P-Val. | % Incr. | Ave.                  | P-Val. | % Incr. |
| LNU814                                                                                 | 78953.3 | 97.3                             | 0.23   | 16      | 12.2                            | 0.23   | 16      | 5.79                  | 0.22   | 7       |
| LNU811                                                                                 | 78176.3 | —                                | —      | —       | —                               | —      | —       | 5.66                  | 0.18   | 4       |
| LNU811                                                                                 | 78176.8 | 95.2                             | 0.21   | 14      | 11.9                            | 0.21   | 14      | —                     | —      | —       |
| LNU811                                                                                 | 78179.1 | 119.1                            | 0.09   | 42      | 14.9                            | 0.09   | 42      | 6.49                  | 0.17   | 20      |
| LNU797                                                                                 | 78021.4 | —                                | —      | —       | —                               | —      | —       | 5.70                  | 0.10   | 5       |
| LNU797                                                                                 | 78025.3 | 100.3                            | 0.15   | 20      | 12.5                            | 0.15   | 20      | 5.96                  | 0.08   | 10      |
| LNU793                                                                                 | 78166.4 | —                                | —      | —       | —                               | —      | —       | 5.96                  | 0.27   | 10      |
| LNU793                                                                                 | 78168.1 | 97.7                             | 0.02   | 17      | 12.2                            | 0.02   | 17      | 5.88                  | 0.08   | 8       |
| LNU793                                                                                 | 78169.2 | 97.8                             | 0.04   | 17      | 12.2                            | 0.04   | 17      | 5.80                  | 0.07   | 7       |
| LNU769                                                                                 | 78163.8 | —                                | —      | —       | —                               | —      | —       | 5.78                  | 0.08   | 6       |
| LNU756                                                                                 | 77581.3 | 98.6                             | 0.26   | 18      | 12.3                            | 0.26   | 18      | 5.89                  | 0.20   | 9       |
| LNU751                                                                                 | 77478.3 | 95.4                             | 0.02   | 14      | 11.9                            | 0.02   | 14      | —                     | —      | —       |
| CONT.                                                                                  | —       | 83.7                             | —      | —       | 10.5                            | —      | —       | 5.43                  | —      | —       |
| LNU972                                                                                 | 78909.3 | 122.2                            | 0.04   | 11      | 15.3                            | 0.04   | 11      | —                     | —      | —       |
| LNU943                                                                                 | 78407.2 | 123.5                            | 0.23   | 12      | 15.4                            | 0.23   | 12      | —                     | —      | —       |
| LNU913                                                                                 | 78592.1 | 121.9                            | 0.05   | 11      | 15.2                            | 0.05   | 11      | 6.47                  | 0.10   | 4       |
| LNU913                                                                                 | 78593.1 | 134.7                            | 0.15   | 22      | 16.8                            | 0.15   | 22      | 6.91                  | L      | 11      |
| LNU864                                                                                 | 79339.2 | 118.0                            | 0.13   | 7       | 14.7                            | 0.13   | 7       | —                     | —      | —       |
| LNU833                                                                                 | 78184.1 | 117.7                            | 0.11   | 7       | 14.7                            | 0.11   | 7       | 6.52                  | 0.18   | 5       |
| LNU764                                                                                 | 78926.1 | 116.1                            | 0.16   | 5       | 14.5                            | 0.16   | 5       | —                     | —      | —       |
| LNU764                                                                                 | 78929.1 | 118.2                            | 0.07   | 7       | 14.8                            | 0.07   | 7       | —                     | —      | —       |
| CONT.                                                                                  | —       | 110.3                            | —      | —       | 13.8                            | —      | —       | 6.21                  | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p &lt; 0.1 was considered as significant.

The genes listed in Table 128 improved plant NUE when grown at standard nitrogen concentration levels. These genes produced faster developing plants when grown under limiting nitrogen growth conditions, compared to control plants, grown under identical growth conditions, as measured by growth rate of leaf number, rosette diameter and plot coverage.

TABLE 128

| Genes showing improved rosette growth performance at standard nitrogen growth conditions |         |                    |        |         |                                             |        |         |                                  |        |         |
|------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                          |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU941                                                                                   | 78613.5 | 0.870              | 0.22   | 18      | —                                           | —      | —       | —                                | —      | —       |
| LNU941                                                                                   | 78615.3 | 0.902              | 0.14   | 23      | —                                           | —      | —       | —                                | —      | —       |
| LNU922                                                                                   | 78290.1 | 0.916              | 0.11   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU918                                                                                   | 78433.8 | 0.889              | 0.16   | 21      | —                                           | —      | —       | —                                | —      | —       |
| LNU918                                                                                   | 78434.2 | 0.864              | 0.27   | 18      | —                                           | —      | —       | —                                | —      | —       |
| LNU915                                                                                   | 78426.1 | —                  | —      | —       | 11.0                                        | 0.28   | 18      | 0.454                            | 0.29   | 16      |
| LNU915                                                                                   | 78428.1 | —                  | —      | —       | 11.4                                        | 0.19   | 22      | —                                | —      | —       |
| LNU915                                                                                   | 78428.2 | 0.871              | 0.20   | 19      | —                                           | —      | —       | —                                | —      | —       |
| LNU909                                                                                   | 78424.3 | 0.919              | 0.09   | 25      | 11.4                                        | 0.19   | 23      | 0.463                            | 0.23   | 18      |
| LNU909                                                                                   | 78425.4 | 0.881              | 0.19   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU849                                                                                   | 78498.4 | 0.880              | 0.19   | 20      | —                                           | —      | —       | —                                | —      | —       |
| LNU830                                                                                   | 78741.3 | 0.859              | 0.25   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU830                                                                                   | 78741.5 | 0.851              | 0.29   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU822                                                                                   | 78623.2 | 0.859              | 0.28   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU813                                                                                   | 77682.3 | 0.862              | 0.27   | 17      | —                                           | —      | —       | —                                | —      | —       |
| LNU806                                                                                   | 78515.4 | 0.921              | 0.10   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU806                                                                                   | 78515.5 | —                  | —      | —       | 12.0                                        | 0.09   | 30      | 0.460                            | 0.27   | 18      |
| LNU779                                                                                   | 77887.3 | 0.887              | 0.16   | 21      | —                                           | —      | —       | —                                | —      | —       |
| CONT.                                                                                    | —       | 0.734              | —      | —       | 9.29                                        | —      | —       | 0.391                            | —      | —       |
| LNU976                                                                                   | 78364.1 | —                  | —      | —       | 5.11                                        | L      | 43      | 0.312                            | 0.02   | 22      |
| LNU976                                                                                   | 78364.5 | —                  | —      | —       | 4.32                                        | 0.07   | 21      | 0.297                            | 0.07   | 17      |
| LNU970                                                                                   | 78388.1 | —                  | —      | —       | 4.32                                        | 0.07   | 21      | —                                | —      | —       |
| LNU970                                                                                   | 78389.8 | —                  | —      | —       | 4.21                                        | 0.12   | 18      | 0.293                            | 0.10   | 15      |

TABLE 128-continued

| Genes showing improved rosette growth performance at standard nitrogen growth conditions |         |                    |        |         |                                             |        |         |                                  |        |         |
|------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                          |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU968                                                                                   | 77918.3 | —                  | —      | —       | 4.01                                        | 0.28   | 13      | —                                | —      | —       |
| LNU968                                                                                   | 77919.4 | —                  | —      | —       | 4.37                                        | 0.06   | 23      | —                                | —      | —       |
| LNU963                                                                                   | 78385.1 | —                  | —      | —       | 4.07                                        | 0.22   | 14      | —                                | —      | —       |
| LNU949                                                                                   | 80553.8 | —                  | —      | —       | 4.22                                        | 0.12   | 19      | 0.286                            | 0.20   | 12      |
| LNU949                                                                                   | 80557.4 | —                  | —      | —       | 4.05                                        | 0.24   | 14      | 0.282                            | 0.25   | 11      |
| LNU902                                                                                   | 79606.5 | —                  | —      | —       | 4.36                                        | 0.09   | 23      | 0.288                            | 0.21   | 13      |
| LNU843                                                                                   | 78962.4 | —                  | —      | —       | 4.08                                        | 0.20   | 15      | —                                | —      | —       |
| LNU790                                                                                   | 78890.1 | —                  | —      | —       | 4.16                                        | 0.14   | 17      | 0.284                            | 0.22   | 11      |
| LNU785                                                                                   | 79616.8 | —                  | —      | —       | 4.26                                        | 0.09   | 20      | —                                | —      | —       |
| LNU767                                                                                   | 79146.1 | —                  | —      | —       | 4.20                                        | 0.14   | 18      | —                                | —      | —       |
| LNU767                                                                                   | 79146.2 | —                  | —      | —       | 4.01                                        | 0.27   | 13      | —                                | —      | —       |
| CONT.                                                                                    | —       | —                  | —      | —       | 3.56                                        | —      | —       | 0.255                            | —      | —       |
| LNU918                                                                                   | 78433.1 | 0.818              | 0.28   | 15      | —                                           | —      | —       | —                                | —      | —       |
| LNU854                                                                                   | 78238.1 | 0.816              | 0.30   | 15      | —                                           | —      | —       | —                                | —      | —       |
| LNU849                                                                                   | 78500.1 | 0.819              | 0.29   | 15      | —                                           | —      | —       | —                                | —      | —       |
| LNU830                                                                                   | 78741.3 | —                  | —      | —       | 15.4                                        | 0.09   | 35      | 0.615                            | 0.12   | 24      |
| LNU830                                                                                   | 78741.5 | —                  | —      | —       | 15.3                                        | 0.11   | 34      | —                                | —      | —       |
| LNU813                                                                                   | 77681.4 | —                  | —      | —       | 14.3                                        | 0.21   | 25      | —                                | —      | —       |
| LNU780                                                                                   | 77489.4 | —                  | —      | —       | 14.3                                        | 0.23   | 25      | —                                | —      | —       |
| CONT.                                                                                    | —       | 0.712              | —      | —       | 11.5                                        | —      | —       | 0.497                            | —      | —       |
| LNU948                                                                                   | 78376.3 | —                  | —      | —       | 13.9                                        | 0.13   | 26      | 0.579                            | 0.29   | 15      |
| LNU948                                                                                   | 78378.1 | —                  | —      | —       | 15.2                                        | 0.04   | 38      | —                                | —      | —       |
| LNU948                                                                                   | 78380.3 | 0.791              | 0.04   | 41      | —                                           | —      | —       | —                                | —      | —       |
| LNU921                                                                                   | 79061.1 | 0.796              | 0.05   | 42      | —                                           | —      | —       | —                                | —      | —       |
| LNU921                                                                                   | 79063.2 | —                  | —      | —       | 13.8                                        | 0.14   | 25      | —                                | —      | —       |
| LNU921                                                                                   | 79064.2 | —                  | —      | —       | 14.4                                        | 0.06   | 31      | 0.632                            | 0.06   | 25      |
| LNU921                                                                                   | 79064.3 | —                  | —      | —       | 16.4                                        | L      | 49      | 0.597                            | 0.16   | 18      |
| LNU921                                                                                   | 79065.1 | 0.781              | 0.05   | 39      | —                                           | —      | —       | —                                | —      | —       |
| LNU912                                                                                   | 78401.4 | —                  | —      | —       | —                                           | —      | —       | 0.582                            | 0.27   | 15      |
| LNU912                                                                                   | 78402.3 | 0.711              | 0.23   | 27      | —                                           | —      | —       | —                                | —      | —       |
| LNU912                                                                                   | 78405.2 | 0.905              | 0.01   | 61      | —                                           | —      | —       | —                                | —      | —       |
| LNU889                                                                                   | 79599.1 | 0.863              | 0.03   | 54      | 13.8                                        | 0.14   | 25      | —                                | —      | —       |
| LNU889                                                                                   | 79601.4 | 0.686              | 0.28   | 22      | —                                           | —      | —       | —                                | —      | —       |
| LNU888                                                                                   | 78771.1 | 0.699              | 0.25   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU881                                                                                   | 78372.2 | 0.740              | 0.22   | 32      | 13.4                                        | 0.18   | 22      | —                                | —      | —       |
| LNU881                                                                                   | 78373.1 | 0.688              | 0.24   | 23      | 14.6                                        | 0.06   | 33      | 0.584                            | 0.22   | 16      |
| LNU881                                                                                   | 78373.2 | —                  | —      | —       | 16.3                                        | 0.01   | 48      | 0.639                            | 0.06   | 27      |
| LNU881                                                                                   | 78374.1 | —                  | —      | —       | 13.9                                        | 0.13   | 26      | —                                | —      | —       |
| LNU881                                                                                   | 78374.4 | 0.725              | 0.16   | 29      | —                                           | —      | —       | —                                | —      | —       |
| LNU865                                                                                   | 79759.4 | 0.829              | 0.03   | 48      | —                                           | —      | —       | —                                | —      | —       |
| LNU865                                                                                   | 79761.2 | —                  | —      | —       | 19.3                                        | L      | 76      | 0.680                            | 0.01   | 35      |
| LNU865                                                                                   | 79761.4 | —                  | —      | —       | 16.5                                        | L      | 50      | 0.663                            | 0.02   | 31      |
| LNU865                                                                                   | 79761.7 | —                  | —      | —       | 14.1                                        | 0.12   | 28      | 0.583                            | 0.25   | 16      |
| LNU857                                                                                   | 78866.1 | 0.755              | 0.09   | 35      | —                                           | —      | —       | —                                | —      | —       |
| LNU857                                                                                   | 78867.1 | 0.789              | 0.08   | 41      | —                                           | —      | —       | —                                | —      | —       |
| LNU857                                                                                   | 78868.2 | 0.717              | 0.21   | 28      | —                                           | —      | —       | —                                | —      | —       |
| LNU857                                                                                   | 78870.1 | 0.704              | 0.25   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU831                                                                                   | 79331.2 | 0.720              | 0.21   | 28      | —                                           | —      | —       | —                                | —      | —       |
| LNU831                                                                                   | 79331.5 | 0.704              | 0.24   | 25      | —                                           | —      | —       | —                                | —      | —       |
| LNU831                                                                                   | 79333.1 | —                  | —      | —       | 14.1                                        | 0.11   | 28      | 0.615                            | 0.11   | 22      |
| LNU831                                                                                   | 79333.2 | —                  | —      | —       | 13.4                                        | 0.25   | 21      | —                                | —      | —       |
| LNU816                                                                                   | 78957.1 | —                  | —      | —       | 15.2                                        | 0.05   | 38      | 0.603                            | 0.15   | 20      |
| LNU816                                                                                   | 78958.2 | 0.692              | 0.25   | 23      | —                                           | —      | —       | —                                | —      | —       |
| LNU816                                                                                   | 78958.4 | 0.768              | 0.10   | 37      | —                                           | —      | —       | —                                | —      | —       |
| LNU816                                                                                   | 78958.5 | —                  | —      | —       | 14.8                                        | 0.05   | 35      | 0.576                            | 0.28   | 14      |
| LNU816                                                                                   | 78958.7 | —                  | —      | —       | 13.7                                        | 0.14   | 25      | —                                | —      | —       |
| LNU809                                                                                   | 79167.2 | 0.762              | 0.08   | 36      | —                                           | —      | —       | —                                | —      | —       |
| LNU809                                                                                   | 79168.5 | 0.831              | 0.03   | 48      | —                                           | —      | —       | —                                | —      | —       |
| LNU807                                                                                   | 79248.1 | 0.773              | 0.10   | 38      | —                                           | —      | —       | —                                | —      | —       |
| LNU807                                                                                   | 79250.1 | 0.688              | 0.26   | 23      | —                                           | —      | —       | —                                | —      | —       |
| LNU795                                                                                   | 79521.6 | 0.766              | 0.07   | 37      | —                                           | —      | —       | —                                | —      | —       |
| LNU795                                                                                   | 79525.1 | —                  | —      | —       | 13.3                                        | 0.21   | 21      | —                                | —      | —       |
| LNU795                                                                                   | 79525.4 | —                  | —      | —       | 14.1                                        | 0.11   | 28      | 0.606                            | 0.15   | 20      |
| LNU788                                                                                   | 78516.1 | —                  | —      | —       | 16.2                                        | L      | 47      | 0.594                            | 0.17   | 18      |
| LNU788                                                                                   | 78517.1 | —                  | —      | —       | 14.3                                        | 0.08   | 30      | —                                | —      | —       |
| LNU788                                                                                   | 78517.2 | —                  | —      | —       | 13.3                                        | 0.25   | 21      | —                                | —      | —       |
| LNU788                                                                                   | 78518.1 | —                  | —      | —       | 17.8                                        | L      | 62      | 0.575                            | 0.29   | 14      |
| LNU788                                                                                   | 78520.4 | 0.791              | 0.07   | 41      | —                                           | —      | —       | —                                | —      | —       |
| LNU783                                                                                   | 79178.2 | 0.720              | 0.19   | 28      | —                                           | —      | —       | —                                | —      | —       |
| LNU783                                                                                   | 79178.4 | —                  | —      | —       | —                                           | —      | —       | 0.587                            | 0.21   | 16      |
| LNU778                                                                                   | 78944.1 | —                  | —      | —       | 16.3                                        | 0.01   | 48      | 0.593                            | 0.21   | 18      |
| LNU778                                                                                   | 78944.2 | 0.719              | 0.23   | 28      | —                                           | —      | —       | —                                | —      | —       |

TABLE 128-continued

| Genes showing improved rosette growth performance at standard nitrogen growth conditions |         |                    |        |         |                                             |        |         |                                  |        |         |   |
|------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|---|
| Gene Name                                                                                | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |   |
|                                                                                          |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |   |
| LNU762                                                                                   | 79326.1 | 0.697              | 0.29   | 24      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU752                                                                                   | 78151.2 | 0.686              | 0.26   | 22      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU752                                                                                   | 78153.1 | 0.684              | 0.28   | 22      | 15.3                                        | 0.05   | 39      | 0.618                            | 0.12   | 22      | — |
| CONT.                                                                                    | —       | 0.561              | —      | —       | 11.0                                        | —      | —       | 0.504                            | —      | —       | — |
| LNU846                                                                                   | 78439.4 | —                  | —      | —       | 15.1                                        | 0.13   | 22      | —                                | —      | —       | — |
| LNU814                                                                                   | 78955.5 | 0.958              | 0.09   | 17      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU772                                                                                   | 78938.1 | —                  | —      | —       | 15.1                                        | 0.13   | 22      | —                                | —      | —       | — |
| LNU757                                                                                   | 77483.2 | 0.925              | 0.19   | 13      | —                                           | —      | —       | —                                | —      | —       | — |
| CONT.                                                                                    | —       | 0.818              | —      | —       | 12.4                                        | —      | —       | —                                | —      | —       | — |
| LNU972                                                                                   | 78907.1 | 0.923              | 0.01   | 20      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU972                                                                                   | 78909.3 | —                  | —      | —       | 10.4                                        | 0.06   | 23      | 0.484                            | 0.08   | 16      | — |
| LNU961                                                                                   | 79143.3 | 0.835              | 0.26   | 8       | —                                           | —      | —       | —                                | —      | —       | — |
| LNU961                                                                                   | 79143.4 | —                  | —      | —       | —                                           | —      | —       | 0.458                            | 0.28   | 10      | — |
| LNU958                                                                                   | 77687.2 | —                  | —      | —       | 10.2                                        | 0.09   | 21      | —                                | —      | —       | — |
| LNU958                                                                                   | 77687.5 | —                  | —      | —       | 10.5                                        | 0.05   | 24      | 0.491                            | 0.06   | 17      | — |
| LNU958                                                                                   | 77689.1 | —                  | —      | —       | 9.75                                        | 0.21   | 15      | —                                | —      | —       | — |
| LNU948                                                                                   | 78378.1 | —                  | —      | —       | 9.85                                        | 0.21   | 17      | 0.469                            | 0.19   | 12      | — |
| LNU948                                                                                   | 78380.2 | —                  | —      | —       | 9.66                                        | 0.26   | 14      | —                                | —      | —       | — |
| LNU921                                                                                   | 79063.2 | —                  | —      | —       | 10.0                                        | 0.15   | 18      | —                                | —      | —       | — |
| LNU921                                                                                   | 79064.3 | —                  | —      | —       | 9.89                                        | 0.17   | 17      | —                                | —      | —       | — |
| LNU913                                                                                   | 78592.1 | —                  | —      | —       | 10.8                                        | 0.04   | 27      | 0.471                            | 0.16   | 13      | — |
| LNU913                                                                                   | 78592.3 | 0.874              | 0.09   | 13      | 10.1                                        | 0.12   | 19      | —                                | —      | —       | — |
| LNU913                                                                                   | 78592.4 | 0.887              | 0.14   | 15      | 10.8                                        | 0.03   | 27      | 0.462                            | 0.24   | 10      | — |
| LNU913                                                                                   | 78593.1 | —                  | —      | —       | 10.2                                        | 0.09   | 21      | —                                | —      | —       | — |
| LNU913                                                                                   | 78593.6 | 0.923              | 0.04   | 20      | 11.2                                        | 0.01   | 33      | 0.460                            | 0.25   | 10      | — |
| LNU912                                                                                   | 78403.2 | 0.846              | 0.22   | 10      | 9.68                                        | 0.24   | 15      | 0.471                            | 0.17   | 13      | — |
| LNU912                                                                                   | 78404.1 | —                  | —      | —       | 9.60                                        | 0.27   | 14      | —                                | —      | —       | — |
| LNU888                                                                                   | 78772.1 | 0.847              | 0.26   | 10      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU888                                                                                   | 78772.7 | 0.877              | 0.14   | 14      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU881                                                                                   | 78372.2 | —                  | —      | —       | 10.1                                        | 0.12   | 20      | 0.467                            | 0.19   | 12      | — |
| LNU881                                                                                   | 78373.2 | 0.856              | 0.21   | 11      | 11.0                                        | 0.02   | 31      | 0.466                            | 0.19   | 11      | — |
| LNU881                                                                                   | 78374.1 | 0.890              | 0.08   | 16      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU823                                                                                   | 78136.4 | —                  | —      | —       | 9.63                                        | 0.26   | 14      | —                                | —      | —       | — |
| LNU816                                                                                   | 78957.1 | —                  | —      | —       | 10.3                                        | 0.09   | 22      | 0.472                            | 0.16   | 13      | — |
| LNU816                                                                                   | 78958.7 | —                  | —      | —       | 11.5                                        | L      | 36      | 0.500                            | 0.03   | 20      | — |
| LNU809                                                                                   | 79168.3 | 0.844              | 0.26   | 10      | 9.74                                        | 0.22   | 15      | —                                | —      | —       | — |
| LNU809                                                                                   | 79169.2 | —                  | —      | —       | 9.59                                        | 0.27   | 13      | —                                | —      | —       | — |
| LNU782                                                                                   | 77441.1 | —                  | —      | —       | 10.4                                        | 0.07   | 23      | —                                | —      | —       | — |
| LNU782                                                                                   | 77444.9 | —                  | —      | —       | 10.4                                        | 0.08   | 22      | —                                | —      | —       | — |
| LNU772                                                                                   | 78938.1 | —                  | —      | —       | 11.9                                        | L      | 41      | 0.524                            | L      | 25      | — |
| LNU772                                                                                   | 78940.2 | —                  | —      | —       | 10.2                                        | 0.10   | 21      | 0.482                            | 0.09   | 15      | — |
| LNU757                                                                                   | 77481.1 | 0.911              | 0.05   | 18      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU757                                                                                   | 77483.3 | 0.841              | 0.29   | 9       | —                                           | —      | —       | —                                | —      | —       | — |
| LNU757                                                                                   | 77485.4 | 0.925              | 0.01   | 20      | —                                           | —      | —       | —                                | —      | —       | — |
| CONT.                                                                                    | —       | 0.770              | —      | —       | 8.45                                        | —      | —       | 0.418                            | —      | —       | — |
| LNU882                                                                                   | 78973.1 | —                  | —      | —       | 10.8                                        | 0.06   | 21      | 0.469                            | 0.09   | 14      | — |
| LNU882                                                                                   | 78973.4 | —                  | —      | —       | 11.1                                        | 0.03   | 24      | 0.456                            | 0.16   | 11      | — |
| LNU865                                                                                   | 79761.2 | —                  | —      | —       | 10.0                                        | 0.24   | 13      | 0.461                            | 0.12   | 12      | — |
| LNU865                                                                                   | 79761.7 | —                  | —      | —       | 10.4                                        | 0.13   | 17      | 0.466                            | 0.10   | 14      | — |
| LNU857                                                                                   | 78867.1 | —                  | —      | —       | 10.3                                        | 0.17   | 15      | 0.459                            | 0.15   | 12      | — |
| LNU848                                                                                   | 77909.3 | —                  | —      | —       | 10.2                                        | 0.21   | 15      | —                                | —      | —       | — |
| LNU835                                                                                   | 78186.2 | —                  | —      | —       | 10.1                                        | 0.23   | 13      | 0.461                            | 0.12   | 13      | — |
| LNU828                                                                                   | 77598.3 | —                  | —      | —       | 10.3                                        | 0.18   | 15      | —                                | —      | —       | — |
| LNU807                                                                                   | 79248.5 | 0.998              | 0.24   | 14      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU798                                                                                   | 79671.4 | —                  | —      | —       | 10.7                                        | 0.06   | 20      | 0.450                            | 0.22   | 10      | — |
| LNU766                                                                                   | 78931.2 | —                  | —      | —       | 10.0                                        | 0.24   | 13      | 0.444                            | 0.30   | 8       | — |
| LNU766                                                                                   | 78932.1 | —                  | —      | —       | 11.3                                        | 0.02   | 26      | 0.456                            | 0.18   | 11      | — |
| LNU752                                                                                   | 78153.1 | 1.02               | 0.16   | 17      | —                                           | —      | —       | —                                | —      | —       | — |
| CONT.                                                                                    | —       | 0.873              | —      | —       | 8.92                                        | —      | —       | 0.410                            | —      | —       | — |
| LNU976                                                                                   | 78364.2 | —                  | —      | —       | —                                           | —      | —       | 0.579                            | 0.14   | 15      | — |
| LNU970                                                                                   | 78389.8 | —                  | —      | —       | 17.5                                        | 0.01   | 38      | 0.578                            | 0.14   | 15      | — |
| LNU970                                                                                   | 78390.3 | —                  | —      | —       | 14.8                                        | 0.25   | 17      | 0.560                            | 0.28   | 11      | — |
| LNU963                                                                                   | 78384.2 | —                  | —      | —       | 15.0                                        | 0.20   | 19      | —                                | —      | —       | — |
| LNU934                                                                                   | 79007.5 | —                  | —      | —       | 15.5                                        | 0.14   | 23      | —                                | —      | —       | — |
| LNU924                                                                                   | 77608.3 | —                  | —      | —       | —                                           | —      | —       | 0.558                            | 0.30   | 11      | — |
| LNU902                                                                                   | 79604.4 | 0.894              | 0.11   | 19      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU790                                                                                   | 78890.1 | —                  | —      | —       | 14.7                                        | 0.26   | 16      | —                                | —      | —       | — |
| LNU790                                                                                   | 78890.3 | 0.881              | 0.16   | 17      | —                                           | —      | —       | —                                | —      | —       | — |
| LNU767                                                                                   | 79146.1 | 0.862              | 0.21   | 15      | —                                           | —      | —       | —                                | —      | —       | — |
| CONT.                                                                                    | —       | 0.750              | —      | —       | 12.6                                        | —      | —       | 0.503                            | —      | —       | — |
| LNU947                                                                                   | 77447.3 | —                  | —      | —       | 11.7                                        | 0.23   | 15      | —                                | —      | —       | — |
| LNU947                                                                                   | 77448.4 | —                  | —      | —       | 15.2                                        | L      | 50      | 0.552                            | L      | 28      | — |

TABLE 128-continued

| Genes showing improved rosette growth performance at standard nitrogen growth conditions |         |                    |        |         |                                             |        |         |                                  |        |         |
|------------------------------------------------------------------------------------------|---------|--------------------|--------|---------|---------------------------------------------|--------|---------|----------------------------------|--------|---------|
| Gene Name                                                                                | Event # | RGR Of Leaf Number |        |         | RGR Of Plot Coverage [cm <sup>2</sup> /day] |        |         | RGR Of Rosette Diameter [cm/day] |        |         |
|                                                                                          |         | Ave.               | P-Val. | % Incr. | Ave.                                        | P-Val. | % Incr. | Ave.                             | P-Val. | % Incr. |
| LNU940                                                                                   | 77812.4 | —                  | —      | —       | 11.7                                        | 0.25   | 15      | —                                | —      | —       |
| LNU940                                                                                   | 77813.1 | —                  | —      | —       | 13.0                                        | 0.03   | 28      | 0.482                            | 0.18   | 12      |
| LNU900                                                                                   | 78851.3 | —                  | —      | —       | 12.2                                        | 0.11   | 21      | —                                | —      | —       |
| LNU900                                                                                   | 78854.3 | —                  | —      | —       | 11.6                                        | 0.26   | 14      | 0.511                            | 0.04   | 19      |
| LNU898                                                                                   | 78983.4 | —                  | —      | —       | 12.7                                        | 0.05   | 26      | 0.482                            | 0.17   | 12      |
| LNU898                                                                                   | 78985.1 | —                  | —      | —       | 12.0                                        | 0.17   | 18      | 0.480                            | 0.21   | 12      |
| LNU894                                                                                   | 78282.3 | —                  | —      | —       | 12.0                                        | 0.20   | 18      | —                                | —      | —       |
| LNU894                                                                                   | 78283.4 | 0.909              | 0.18   | 16      | 12.4                                        | 0.11   | 22      | —                                | —      | —       |
| LNU894                                                                                   | 78283.7 | —                  | —      | —       | 12.8                                        | 0.07   | 27      | 0.485                            | 0.28   | 13      |
| LNU846                                                                                   | 78438.2 | —                  | —      | —       | —                                           | —      | —       | 0.476                            | 0.26   | 11      |
| LNU846                                                                                   | 78439.4 | —                  | —      | —       | 13.8                                        | 0.01   | 36      | 0.499                            | 0.13   | 16      |
| LNU820                                                                                   | 77807.2 | —                  | —      | —       | 12.2                                        | 0.11   | 21      | 0.502                            | 0.06   | 17      |
| LNU815                                                                                   | 77492.6 | —                  | —      | —       | 12.5                                        | 0.11   | 23      | 0.479                            | 0.28   | 11      |
| LNU815                                                                                   | 77494.1 | —                  | —      | —       | 13.8                                        | L      | 36      | 0.510                            | 0.04   | 19      |
| LNU815                                                                                   | 77495.3 | —                  | —      | —       | —                                           | —      | —       | 0.476                            | 0.23   | 11      |
| LNU814                                                                                   | 78953.2 | —                  | —      | —       | 12.1                                        | 0.13   | 20      | 0.490                            | 0.13   | 14      |
| LNU814                                                                                   | 78953.3 | —                  | —      | —       | 11.8                                        | 0.23   | 16      | —                                | —      | —       |
| LNU811                                                                                   | 78176.8 | —                  | —      | —       | 11.6                                        | 0.25   | 15      | —                                | —      | —       |
| LNU811                                                                                   | 78179.1 | —                  | —      | —       | 14.2                                        | L      | 41      | 0.517                            | 0.05   | 20      |
| LNU797                                                                                   | 78025.3 | —                  | —      | —       | 12.2                                        | 0.14   | 20      | 0.487                            | 0.16   | 13      |
| LNU793                                                                                   | 78166.4 | —                  | —      | —       | 12.1                                        | 0.15   | 19      | 0.479                            | 0.24   | 11      |
| LNU793                                                                                   | 78168.1 | —                  | —      | —       | 12.1                                        | 0.13   | 19      | 0.493                            | 0.11   | 15      |
| LNU793                                                                                   | 78169.2 | —                  | —      | —       | 11.9                                        | 0.19   | 17      | —                                | —      | —       |
| LNU769                                                                                   | 78163.4 | —                  | —      | —       | —                                           | —      | —       | 0.488                            | 0.20   | 14      |
| LNU769                                                                                   | 78163.8 | —                  | —      | —       | —                                           | —      | —       | 0.480                            | 0.22   | 12      |
| LNU756                                                                                   | 77581.3 | —                  | —      | —       | 12.1                                        | 0.14   | 20      | 0.483                            | 0.19   | 12      |
| LNU751                                                                                   | 77477.1 | 0.878              | 0.25   | 12      | —                                           | —      | —       | —                                | —      | —       |
| LNU751                                                                                   | 77477.4 | 0.914              | 0.19   | 16      | —                                           | —      | —       | —                                | —      | —       |
| LNU751                                                                                   | 77478.3 | —                  | —      | —       | 11.7                                        | 0.23   | 15      | —                                | —      | —       |
| CONT.                                                                                    | —       | 0.786              | —      | —       | 10.1                                        | —      | —       | 0.430                            | —      | —       |
| LNU913                                                                                   | 78593.1 | —                  | —      | —       | 16.7                                        | 0.09   | 23      | —                                | —      | —       |
| LNU896                                                                                   | 78978.1 | 0.887              | 0.26   | 14      | —                                           | —      | —       | —                                | —      | —       |
| CONT.                                                                                    | —       | 0.777              | —      | —       | 13.6                                        | —      | —       | —                                | —      | —       |

"CONT."—Control;

"Ave."—Average;

"% Incr." = % Increment;

"p-val."—p-value;

L means that p-value is less than 0.01, p < 0.1 was considered as significant.

### Example 19

#### Evaluation of Transgenic *Brachypodium* NUE and Yield Under Low or Normal Nitrogen Fertilization in Greenhouse Assay

Assay 1: Nitrogen Use Efficiency Measured Plant Biomass and Yield at Limited and Optimal Nitrogen Concentration Under Greenhouse Conditions Until Heading—

This assay follows the plant biomass formation and growth (measured by height) of plants which are grown in the greenhouse at limiting and non-limiting (e.g., normal) nitrogen growth conditions. Transgenic *Brachypodium* seeds were sown in peat plugs. The T<sub>1</sub> transgenic seedlings were then transplanted to 27.8×11.8×8.5 cm trays filled with peat and perlite in a 1:1 ratio. The trays were irrigated with a solution containing nitrogen limiting conditions, which were achieved by irrigating the plants with a solution containing 3 mM inorganic nitrogen in the form of NH<sub>4</sub>NO<sub>3</sub>, supplemented with 1 mM KH<sub>2</sub>PO<sub>4</sub>, 1 mM MgSO<sub>4</sub>, 3.6 mM KCl, 2 mM CaCl<sub>2</sub> and microelements, while normal nitrogen levels were achieved by applying a solution of 6 mM inorganic nitrogen also in the form of NH<sub>4</sub>NO<sub>3</sub> with 1 mM KH<sub>2</sub>PO<sub>4</sub>, 1 mM MgSO<sub>4</sub>, 2 mM CaCl<sub>2</sub>, 3.6 mM KCl and microelements. All plants were grown in the greenhouse until heading. Plant biomass (the above ground tissue) was

weighted right after harvesting the shoots (plant fresh weight [FW]). Following, plants were dried in an oven at 70° C. for 48 hours and weighed (plant dry weight [DW]).

Each construct was validated at its T<sub>1</sub> generation. Transgenic plants transformed with a construct conformed by an empty vector carrying the BASTA selectable marker were used as control (FIG. 9B).

The plants were analyzed for their overall size, fresh weight and dry matter. Transgenic plants performance was compared to control plants grown in parallel under the same conditions. Mock—transgenic plants with no gene and no promoter at all, were used as control (FIG. 9B).

The experiment was planned in blocks and nested randomized plot distribution within them. For each gene of the invention five independent transformation events were analyzed from each construct.

#### Phenotyping

Plant Fresh and Dry shoot weight—In Heading assays when heading stage has completed (about day 30 from sowing), the plants were harvested and directly weighed for the determination of the plant fresh weight on semi-analytical scales (0.01 gr) (FW) and left to dry at 70° C. in a drying chamber for about 48 hours before weighting to determine plant dry weight (DW).

Time to Heading—In both Seed Maturation and Heading assays heading was defined as the full appearance of the first

spikelet in the plant. The time to heading occurrence is defined by the date the heading is completely visible. The time to heading occurrence date was documented for all plants and then the time from planting to heading was calculated.

Leaf thickness—In Heading assays when minimum 5 plants per plot in at least 90% of the plots in an experiment have been documented at heading, measurement of leaf thickness was performed using a micro-meter on the second leaf below the flag leaf.

Plant Height—In both Seed Maturation and Heading assays once heading was completely visible, the height of the first spikelet was measured from soil level to the bottom of the spikelet.

Tillers number—In Heading assays manual count of tillers was preformed per plant after harvest, before weighing.

#### Example 20

##### Evaluation of Transgenic *Brachypodium* NUE and Yield Under Low or Normal Nitrogen Fertilization in Greenhouse Assay

Assay 2: Nitrogen Use Efficiency Measured Plant Biomass and Yield at Limited and Optimal Nitrogen Concentration Under Greenhouse Conditions Until Seed Maturation—

This assay follows the plant biomass and yield production of plants that were grown in the greenhouse at limiting and non-limiting nitrogen growth conditions. Transgenic *Brachypodium* seeds were sown in peat plugs. The T<sub>1</sub> transgenic seedlings were then transplanted to 27.8×11.8×8.5 cm trays filled with peat and perlite in a 1:1 ratio. The trays were irrigated with a solution containing nitrogen limiting conditions, which were achieved by irrigating the plants with a solution containing 3 mM inorganic nitrogen in the form of NH<sub>4</sub>NO<sub>3</sub>, supplemented with 1 mM KH<sub>2</sub>PO<sub>4</sub>, 1 mM MgSO<sub>4</sub>, 3.6 mM KCl, 2 mM CaCl<sub>2</sub> and microelements, while normal nitrogen levels were achieved by applying a solution of 6 mM inorganic nitrogen also in the form of NH<sub>4</sub>NO<sub>3</sub> with 1 mM KH<sub>2</sub>PO<sub>4</sub>, 1 mM MgSO<sub>4</sub>, 2 mM CaCl<sub>2</sub>, 3.6 mM KCl and microelements. All plants were grown in the greenhouse until seed maturation. Each construct was validated at its T<sub>1</sub> generation. Transgenic plants transformed with a construct conformed by an empty vector carrying the BASTA selectable marker were used as control (FIG. 9B).

The plants were analyzed for their overall biomass, fresh weight and dry matter, as well as a large number of yield and yield components related parameters. Transgenic plants performance was compared to control plants grown in parallel under the same conditions. Mock—transgenic plants with no gene and no promoter at all (FIG. 9B). The experiment was planned in blocks and nested randomized plot distribution within them. For each gene of the invention five independent transformation events were analyzed from each construct.

#### Phenotyping

Plant Fresh and Dry vegetative weight—In Seed Maturation assays when maturity stage has completed (about day 80 from sowing), the plants were harvested and directly weighed for the determination of the plant fresh weight (FW) and left to dry at 70° C. in a drying chamber for about 48 hours before weighting to determine plant dry weight (DW).

Spikelets Dry weight (SDW)—In Seed Maturation assays when maturity stage has completed (about day 80 from sowing), the spikelets were separated from the biomass, left

to dry at 70° C. in a drying chamber for about 48 hours before weighting to determine spikelets dry weight (SDW).

Grain Yield per Plant—In Seed Maturation assays after drying of spikelets for SDW, spikelets were run through production machine, then through cleaning machine, until seeds were produced per plot, then weighed and Grain Yield per Plant was calculated.

Grain Number—In Seed Maturation assays after seeds per plot were produced and cleaned, the seeds were run through a counting machine and counted.

1000 Seed Weight—In Seed Maturation assays after seed production, a fraction was taken from each sample (seeds per plot; ~0.5 gr), counted and photographed. 1000 seed weight was calculated.

Harvest Index—In Seed Maturation assays after seed production, harvest index was calculated by dividing grain yield and vegetative dry weight.

Time to Heading—In both Seed Maturation and Heading assays heading was defined as the full appearance of the first spikelet in the plant. The time to heading occurrence is defined by the date the heading is completely visible. The time to heading occurrence date was documented for all plants and then the time from planting to heading was calculated.

Leaf thickness—In Heading assays when minimum 5 plants per plot in at least 90% of the plots in an experiment have been documented at heading, measurement of leaf thickness was performed using a micro-meter on the second leaf below the flag leaf.

Grain filling period—In Seed Maturation assays maturation was defined by the first color-break of spikelet+stem on the plant, from green to yellow/brown.

Plant Height—In both Seed Maturation and Heading assays once heading was completely visible, the height of the first spikelet was measured from soil level to the bottom of the spikelet.

Tillers number—In Heading assays manual count of tillers was preformed per plant after harvest, before weighing.

Number of reproductive heads per plant—In Heading assays manual count of heads per plant was performed.

Statistical analyses—To identify genes conferring significantly improved tolerance to abiotic stresses, the results obtained from the transgenic plants were compared to those obtained from control plants. To identify outperforming genes and constructs, results from the independent transformation events tested were analyzed separately. Data was analyzed using Student's t-test and results were considered significant if the p value was less than 0.1. The JMP statistics software package was used (Version 5.2.1, SAS Institute Inc., Cary, N.C., USA).

Although the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all such alternatives, modifications and variations that fall within the spirit and broad scope of the appended claims.

All publications, patents and patent applications mentioned in this specification are herein incorporated in their entirety by reference into the specification, to the same extent as if each individual publication, patent or patent application was specifically and individually indicated to be incorporated herein by reference. In addition, citation or identification of any reference in this application shall not be construed as an admission that such reference is available as prior art to the present invention. To the extent that section headings are used, they should not be construed as necessarily limiting.

## SEQUENCE LISTING

The patent contains a lengthy "Sequence Listing" section. A copy of the "Sequence Listing" is available in electronic form from the USPTO web site (<http://seqdata.uspto.gov/?pageRequest=docDetail&DocID=US09771598B2>). An electronic copy of the "Sequence Listing" will also be available from the USPTO upon request and payment of the fee set forth in 37 CFR 1.19(b)(3).

What is claimed is:

1. A method of increasing growth rate and/or biomass of a plant under nitrogen-limiting conditions, comprising:
  - (a) over-expressing within the plant an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide having at least 95% sequence identity and conservative amino acid substitutions with respect to the polypeptide set forth by SEQ ID NO:589, or encoding the polypeptide selected from the group consisting of SEQ ID NO: 589, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, and 3645, and
  - (b) selecting plants resultant from step (a) over-expressing said polynucleotide for an increased biomass and/or growth rate under nitrogen-limiting conditions as compared to a control plant of the same species which is grown under the same growth conditions, thereby increasing the growth rate, and/or biomass of the plant under the nitrogen-limiting conditions.
2. The method of claim 1, wherein said polypeptide is selected from the group consisting of SEQ ID NOs: 589, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, and 3645.
3. A method of producing a crop comprising growing a crop plant transformed with an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide at least 95% identical and having conservative amino acid substitutions with respect to the polypeptide set forth by SEQ ID NO:589, or encoding the polypeptide selected from the group consisting of SEQ ID NOs: 589, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, and 3645, wherein the crop plant is derived from plants selected for increased biomass and/or increased growth rate under nitrogen-limiting as compared to a control plant of the same species which is grown under the same growth conditions, and the crop plant having the increased biomass, and/or the increased growth rate, thereby producing the crop.
4. The method of claim 1, wherein said exogenous polynucleotide encoding said polypeptide comprises the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 377, 94, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1630, 1631, 1632, 1633 and 1635.
5. The method of claim 3, wherein said exogenous polynucleotide comprising the nucleic acid sequence selected from the group consisting of SEQ ID NOs: 377, 94, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1630, 1631, 1632, 1633 and 1635.
6. The method of claim 3, wherein said exogenous polynucleotide encoding said polypeptide comprises a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 377 and 94.
7. The method of claim 3, wherein said polypeptide is selected from the group consisting of SEQ ID NOs: 589, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, and 3645.
8. The method of claim 1, further comprising growing the plant expressing said exogenous polynucleotide under nitrogen-limiting conditions.
9. A method of selecting a transformed plant, comprising:
  - (a) providing transgenic plants transformed with an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide having at least 95% sequence identity and conservative amino acid substitutions with respect to the polypeptide set forth by SEQ ID NO:589, or encoding the polypeptide selected from the group consisting of SEQ ID NO: 589, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, and 3645, and
  - (b) selecting said plants for an increased growth rate and/or biomass under nitrogen-limiting conditions as compared to a control plant of the same species which is grown under the same growth conditions, thereby selecting the plant having increased growth rate and/or biomass under the nitrogen-limiting conditions as compared to the control plant of the same species which is grown under the same growth conditions.
10. The method of claim 9, wherein said polypeptide is selected from the group consisting of SEQ ID NOs: 589, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, and 3645.
11. The method of claim 1, wherein said polypeptide is set forth by SEQ ID NO: 589.
12. The method of claim 1, wherein said polynucleotide is set forth by SEQ ID NO: 377 or 94.
13. The method of claim 3, wherein said polypeptide is set forth by SEQ ID NO: 589.
14. The method of claim 9, wherein said polypeptide is set forth by SEQ ID NO: 589.
15. The method of claim 1, further comprising:
  - (c) isolating plants or regenerable portion of said plants selected according to the method of claim 1 step (b) having said increased growth rate and/or said increased biomass under said nitrogen-limiting conditions so as to obtain isolated plants or regenerable portion of said selected plants; and
  - (d) planting or regenerating plants from said isolated plants or regenerable portion of said selected plants to thereby obtain plants characterized by said increased biomass and/or said increased growth rate under nitrogen-limiting conditions.
16. The method of claim 1, further comprising generating a plant line by:
  - (a) isolating a plant or a regenerable portion of said plant selected according to the method of claim 1 step (b)

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- having said increased growth rate and/or said increased biomass under said nitrogen-limiting conditions so as to obtain an isolated plant or a regenerable portion of said selected plant; and
- (b) using marker assisted selection of said isolated plant or regenerable portion of said selected plant for selective breeding of plants characterized by said increased biomass and/or said increased growth rate under nitrogen-limiting conditions.
17. The method of claim 9, further comprising:
- (c) isolating plants or regenerable portion of said plants selected according to the method of claim 9 step (b) having said increased growth rate and/or said increased biomass under said nitrogen-limiting conditions so as to obtain isolated plants or regenerable portion of said selected plants; and
- (d) planting or regenerating plants from said isolated plants or regenerable portion of said selected plants to thereby obtain plants characterized by said increased biomass and/or said increased growth rate under nitrogen-limiting conditions.
18. The method of claim 9, further comprising generating a plant line by:
- (a) isolating a plant or a regenerable portion of said plant selected according to the method of claim 9 step (b) having said increased growth rate and/or said increased biomass under said nitrogen-limiting conditions so as to obtain an isolated plant or a regenerable portion of said selected plant; and
- (b) using marker assisted selection of said isolated plant or regenerable portion of said selected plant for selective breeding of plants characterized by said increased biomass and/or said increased growth rate under nitrogen-limiting conditions.
19. A method of selecting a transformed plant, comprising:
- (a) providing transgenic plants transformed with an exogenous polynucleotide comprising a nucleic acid sequence encoding a polypeptide having at least 95% sequence identity and conservative amino acid substitutions with respect to the polypeptide set forth by SEQ ID NO:589, or the polypeptide selected from the group consisting of SEQ ID NOs: 589, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, and 3645, and;
- (b) selecting transformed plants for an increased leaf number, plot coverage, rosette area, rosette diameter, relative growth rate of leaf number, relative growth rate of plot coverage, and/or relative growth rate of rosette diameter under nitrogen-limiting conditions as com-

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pared to a wild type plant of the same species which is grown under the same growth conditions, thereby selecting the plant.

20. The method of claim 19, wherein said polypeptide is selected from the group consisting of SEQ ID NOs: 589, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, and 3645.

21. The method of claim 19, wherein said polypeptide is set forth by SEQ ID NO: 589.

22. The method of claim 19, further comprising:

(c) isolating plants or regenerable portion of said plants selected according to the method of claim 19 step (b) having said increased leaf number, said increased plot coverage, said increased rosette area, said increased rosette diameter, said increased relative growth rate of leaf number, said increased relative growth rate of plot coverage, and/or said increased relative growth rate of rosette diameter under said nitrogen-limiting conditions so as to obtain isolated plants or regenerable portion of said selected plants, and

(d) planting or regenerating plants from said isolated plants or regenerable portion of said selected plants to thereby obtain a plant line characterized by said increased leaf number, said increased plot coverage, said increased rosette area, said increased rosette diameter, said increased relative growth rate of leaf number, said increased relative growth rate of plot coverage, and/or said increased relative growth rate of rosette diameter under said nitrogen-limiting conditions.

23. The method of claim 19, further comprising generating a plant line by:

(a) isolating a plant or a regenerable portion of said plant selected according to the method of claim 19 step (b) having said increased leaf number, said increased plot coverage, said increased rosette area, said increased rosette diameter, said increased relative growth rate of leaf number, said increased relative growth rate of plot coverage, and/or said increased relative growth rate of rosette diameter under said nitrogen-limiting conditions so as to obtain an isolated plant or a regenerable portion of said selected plant, and

(b) using marker assisted selection of said isolated plant or regenerable portion of said selected plant for selective breeding of plants characterized by said increased leaf number, said increased plot coverage, said increased rosette area, said increased rosette diameter, said increased relative growth rate of leaf number, said increased relative growth rate of plot coverage, and/or said increased relative growth rate of rosette diameter under said nitrogen-limiting conditions.

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